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AND EXPERIMENTS, PROCURES KNOWLEDGE FOR MEN"—JAMES SMITHSON

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FACTS AND THEORIES CONCERNING THE INSECT HEAD

By

R. E. SNODGRASS

Honorary Research Associate
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FACTS AND THEORIES CONCERNING THE INSECT HEAD

By R. E. SNODGRASS
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INTRODUCTION

We can feel fairly confident that the insect head has not changed since the first entomologist looked at it and described it. Yet a review of what has subsequently been written about the insect head shows that our ideas about its structure and segmental composition have changed very much. Morphology is an attempt to understand the significance of anatomical facts in their relation to one another, and to reconstruct from the known facts the evolutionary development by which the animal has come to be what it is today. Consequently as new facts come to light our morphology has to be revised to fit them, though it sometimes seems as if some morphologists find it easier to make the facts fit their theories. Ontogeny and anatomy are visible facts not always correctly observed; morphology and phylogeny are mental concepts that cannot be demonstrated. Hence, descriptions of facts by different observers may be inconsistent, and theories about them will vary according to our individual ways of thinking. The present paper, therefore, is a version of the insect head structure according to the facts now presumed to be known about it, and of morphological ideas according to the writer's personal way of interpreting the facts.

No new theory is here introduced, but critical attention will be given to some current theories about the segmentation of the insect head. It does not seem that we really need a theory on the subject, since the embryo gives us a very good idea about how the insect head has been evolved. Nevertheless, some morphologists contend that the embryo may be deceptive and itself needs to be interpreted, while some would even discard embryonic evidence as having no evolutionary value.

Elongate animals that habitually move in one direction necessarily have their principal sense organs at the forward end of the body.

Since this end comes first in contact with whatever may serve as food, the mouth also is usually at or near the anterior end. Thus the anterior part of the animal has become structurally a head bearing the orienting sense organs and the mouth. All animals that have a stomach have a mouth; the mouth is as old as the blastopore. Yet it would seem that the primitive animals had no jaws or other special feeding organs associated with the mouth. In their later evolution the common need for such organs has been met in various ways. Among the coelenterates a circle of grasping tentacles was developed around the mouth. The earthworm ingests mud sucked in by a muscular pharynx, but some of its polychaete relatives developed teeth or jawlike organs in the pharynx, which became eversible as a proboscis. In the ancestral vertebrates two pairs of preexisting gill arches were converted into jaws, which are permanently within the mouth. The arthropods are unique in that their feeding organs have been fashioned from a pair or several pairs of legs behind the mouth. The forelimbs or fingers of some quadruped or biped vertebrates, of course, are often used for grasping food and putting it into the mouth, but they have never become modified for biting and chewing. The primitive arthropods, however, had so many legs they could well spare a few for purposes other than that of locomotion.

The adult head of an insect is a composite structure in which the segments of the feeding appendages have been intimately combined with a primitive head that was principally sensory in function. The insect head is thus superior in many ways to the head of any other animal in the number of functional units it contains. It is a cranial structure provided with sense organs of numerous kinds, and a feeding apparatus capable of being modified for feeding in various ways on different kinds of food. The sensory organs include simple and compound eyes, and a pair of antennae that are delicately sensitive to touch and odor, and, in some cases, to sound. The feeding organs in their simplest form serve for grasping, biting, and chewing, but all together they may be modified and combined in different ways to form a complex apparatus for sucking, or for piercing and sucking. The insects in general are thus enabled to diversify their diet and to get their food from many different sources. By contrast, the vertebrate animals, provided only with jaws for biting and chewing and a tongue for licking and lapping, are practically limited to one way of feeding. Moreover, to sample any substance for food the vertebrate must take it into its mouth, where the gustatory organs are located. The taste organs of insects, on the other hand, are outside the mouth, very

conveniently, in some cases, on the feet, so that an insect can select its appropriate food without first taking it into its mouth. Insects that have biting jaws masticate their food outside the mouth, and in all insects the duct of the salivary glands discharges extraorally, so that the saliva can mix with the food before ingestion.

From all this it is evident that a number of advanced ideas have been incorporated in the organization of the insect head that makes it a structure quite different from our own head, and gives the insects advantages that we vertebrates do not possess.

I. DEVELOPMENT AND EVOLUTION OF THE HEAD

The insects in their evolution, if we may rely on the embryo for historical information, did not get their modern head all at once. The head of the young embryo, particularly in the more generalized insect orders, is a large lobe at the anterior end of the body, usually itself bilobed (fig. 1 A, *emH*), on which are developed the eyes, the antennae, and the labrum. Following the embryonic head is the elongate body, which becomes segmented, and eventually on the segments appear the rudiments of paired appendages in the form of small latero-ventral outgrowths. The mouth of the embryo (*Mth*) is formed ventrally at the base of the cephalic lobe by ingrowth of an ectodermal stomodaeum. In front of the mouth the labrum (*Lm*) projects usually as a small lobe on the underside of the head.

The cephalic lobe of the embryo is not limited to the insects; it is repeated in an early embryonic stage of so many of the arthropods as to suggest that it represents a primary head structure developed by the common ancestors of these animals. This theoretically primitive head might be called the archicephalon, but DuPorte (1953) has appropriately named its embryonic representative the *blastocephalon*, a term that need have no phylogenetic significance. Some writers have interpreted the embryonic head as representing the prostomium of the annelids, or of the ancestral arthropods; others contend that it includes primary body segments added to the prostomium. It contains the ocular and antennal nerve centers, which become the protocerebrum and deutocerebrum of the definitive brain. It is not to be supposed that the size of the embryonic *blastocephalon* means that the ancestral arthropods were big-headed animals. The *blastocephalon* probably is enlarged to give a precocious start to the development of the contained nerve centers.

The head of the adult insect includes at least three primarily body segments, and probably some remnant of a fourth segment, which

during embryonic development are added to the blastocephalon. The imaginal head, therefore, is a *syncephalon* and evidently is a product of evolution. The cephalized body segments include those of the mandibles (fig. 1 B, *Md*), the first maxillae (*1Mx*), and the second maxillae (*2Mx*), so that in the modern adult head the organs of feed-

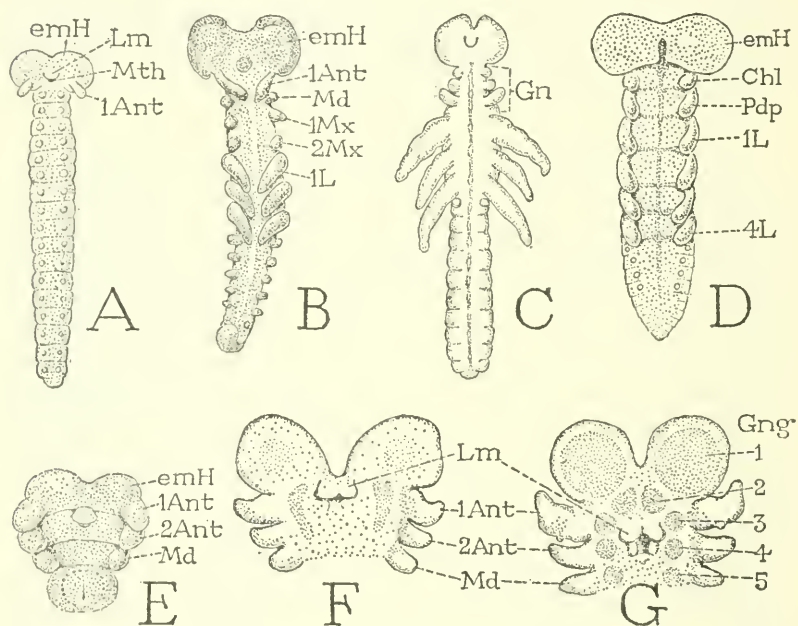


FIG. 1.—Examples of arthropod embryos, illustrating particularly the embryonic head (*emH*), or blastocephalon.

A, General structure of a young embryo, ventral, diagrammatic. B, Embryo of a mantid, *Paratenodera sinensis* (from Hagan, 1917). C, Embryo of a hemipteron *Ranatra fusca* (from Hussey, 1926) with distinct gnathal tagma (*Gn*) between head and thorax. D, Embryo of a spider, *Agelena labyrinthica* (from Balfour, 1880). E, Embryonic nauplius stage of a crustacean, *Leander serratus* (from Sollaud, 1923). F, Head region of an amphipod embryo, *Gammarus pulex pulex* (from Weygoldt, 1958). G, Later stage of same (from Weygoldt, 1958).

ing become closely associated with the mouth and the anterior sense organs.

There is no question that the three segments mentioned above, the so-called *gnathal segments*, become an intimate part of the definitive cranium in both the insects and the chilopods. It is commonly assumed that a premandibular, or first postoral body segment is also included in the adult head. The principal evidence of the existence of this segment, however, is the presence of a pair of premandibular

ganglia that become the tritocerebral lobes of the definitive insect brain. Otherwise the segment of these ganglia cannot be recognized in the composition of the adult cranium, and it is but little evident in the embryo, though embryonic vestiges of premandibular appendages have been observed in several insect species. A short region in the embryo of *Japyx* between the mouth and the mandibular segment is identified by Silvestri (1933) as the tritocerebral segment, since, though it bears no trace of appendages, it does contain rudiments of a pair of ganglia. Likewise in the embryo of a centipede, *Scolopendra*, Heymons (1901) regarded a space between the antennae and the mandibles as pertaining to the tritocerebral segment because of the presence of paired coelomic sacs and ganglion rudiments within it. In the symphylan *Hanseniella*, Tiegs (1940) says, "the pre-mandibular ectoderm curves round the stomodaeal opening, and forms much of the inferior surface of the clypeo-labrum," but he admits this has not been demonstrated in the insects.

The development of ganglia from the postoral ectoderm that become directly the tritocerebral lobes of the brain has been observed in insects by so many writers that there can be no question concerning the origin of the tritocerebral ganglia in the insects. These ganglia are always connected by a suboesophageal commissure, and give off the root nerves of the preoral frontal ganglion. The tritocerebral segment itself, however, appears to be practically eliminated. Eastham (1930), in his study of the embryogeny of *Pieris*, says that "when the premandibular ectoderm has given rise to the tritocerebral neuroblasts it loses its distinctness as a segment and is no longer distinguishable." However, a premandibular segment is present as a distinct somite in the crustacean embryo (fig. 1 E), bearing the rudiments of second antennal appendages (2*Ant*). A corresponding segment of the chelicerae is present in the embryo of Arachnida (D, *Chl*). It may be inferred, therefore, that a fully developed premandibular segment was present in the ancestors of all the mandibulate arthropods, and a corresponding cheliceral segment in the chelicerates.

The cephalic nervous system of the Crustacea appears to be more primitive than that of the insects and myriapods. In the crustaceans small premandibular ganglia are present as swellings on the nerve connectives between the brain and the mandibular ganglia. They are united by a suboesophageal commissure, and give off the root nerves of a small preoral "oesophageal" ganglion, which clearly is the frontal ganglion of the insects. In the branchiopods the nerves of the second antennae are given off from the connectives close to the ganglia. These ganglia on the connectives in the Crustacea thus appear to be the trito-

cerebral ganglia of the insects not united with the brain; they are called the tritocerebral ganglia by Henry (1948) and by Young (1959). In most of the Malacostraca, however, the second antennal nerves arise from the back of the brain, which is now termed the tritocerebrum. The terminology here is somewhat confusing, since in the insects the tritocerebral lobes of the brain are the premandibular ganglia themselves united with the primitive brain. In the higher crustaceans it would appear that only the nerves of the second antennae have been transposed to the brain, as depicted by Henry (1948) in a series of drawings of the anterior nervous system of an anostracan, a notostracan, an isopod, an amphipod, and a decapod.

Among the mandibulate arthropods the segmental composition of the definitive head is quite different in different groups. There is one case in which it appears that the embryonic blastocephalon alone becomes the functional head of the adult, and this is seen in the crustacean order Leptostraca. In *Nebalia bipes* a small head lobe (fig. 2 B) bearing the eyes, the first antennae, and ventrally the labrum projects freely from beneath the rostrum (A). The large second antennae (2Ant) arise close behind this head lobe but from the region of the gnathal segments, on which the carapace (Cp) has its attachment, and the antennal muscles here take their origins.

A distinct head lobe bearing the eyes and the first antennae is present likewise in the anostracan branchiopods, in the Syncarida, and in Malacostraca having a carapace, but in these forms the head always carries the second antennae in addition to the first antennae and the eyes. The best example of this type of head, termed the *protocephalon*, or by German writers the *Vorderkopf*, is seen in the Anostraca (fig. 2 C, *Prtc*). A similar but relatively smaller head unit is present in Anaspidacea and in the decapods (D), in the latter concealed beneath the rostrum. The muscles of the second antennae, however, as shown by Schmidt (1915) in *Astacus* and by Grobben (1919) in a stomatopod, retain their origins on the carapace as in the Leptostraca. In the anostracan (C) the antennal muscles appear to arise on the line between the protocephalon and the mandibular tergum (II), there being no evidence of a second antennal segment contained in the protocephalon.

The so-called protocephalon, therefore, appears to be the embryonic blastocephalon invaded by the second antennae, but it does not include the second antennal segment. Admittedly it seems an improbable assumption that a pair of appendages should migrate from one segment to another. The second antennae, however, are never developed on the embryonic blastocephalon, and pertain to the

first segment following. In a stomatopod the second antennae are membranously connected with the protocephalon, in some other crustaceans they arise just within the posterior sclerotized margin of the head, and in an amphipod they have almost come together on the midline of the face. Certainly in the amphipod the second antennae must have migrated from their own segment into the blastocephalic

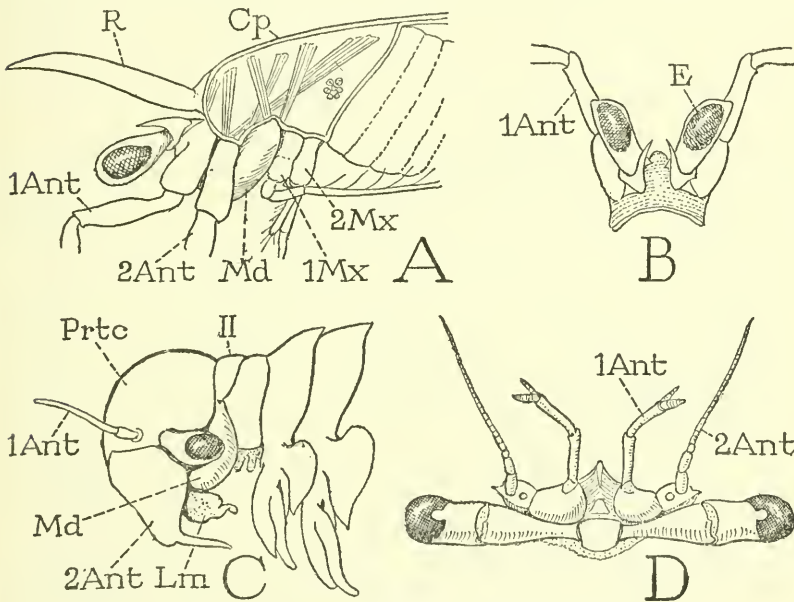


FIG. 2.—Examples of simple crustacean heads.

A, *Nebalia bipes*, anterior end of body, gnathal region opened on left side. B, Same, free head lobe, dorsal. C, *Eubbranchipus vernalis*, protocephalon (Prtc) and anterior trunk segments, mandibular segment (II) not united with head. D, *Callinectes sapidus*, protocephalon, dorsal.

part of the head. The crustacean protocephalon, therefore, evidently represents the embryonic head lobe which has secondarily taken over the second antennae, while the segment of these appendages has been eliminated. The first persisting postoral segment (fig. 2 C, II) is that of the mandibles (Md).

If the cephalic lobe of the embryo represents the primitive arthropod head, or at least an early stage in the head evolution, it was merely a sensory outpost at the anterior end of the animal. At this period the wormlike lobopod progenitors of the arthropods and the onychophorans probably had no specific feeding organs outside the mouth. Some of the legs behind the mouth evidently served for grasping

food and bringing it to the mouth. These legs later become structurally modified to serve specifically as feeding organs. The labrum, when developed as a preoral lobe, must have served to stop the food passed forward where it could be taken into the mouth. The appendages utilized as feeding organs, however, differ in different arthropod groups.

In modern Onychophora the claws of the first pair of legs have been converted into a pair of flat "jaws" working in a vertical plane in front of the mouth. The ancient trilobites had no jaws or other special mouth parts, but the legs had spiny lobes on the inner sides of the coxae, by which probably food was grasped and passed forward to the mouth. In the ancestors of the chelicerate arthropods the first pair of postoral appendages became small pincerlike organs, the chelicerae, from which this group gets its name. In another early arthropod group the coxae of the second postoral legs were developed into a pair of jaws, the mandibles, working in the transverse plane, while the rest of the limb was reduced to a palpus and usually eliminated. Members of this group became the Mandibulata (crustaceans, myriapods, and insects) characterized by the possession of mandibles. The following pair of legs, or generally two pairs, were then modified as accessory feeding organs, known as the first and the second maxillae. In most of the Mandibulata the segments of these gnathal appendages were combined with the protocephalon in the adult head. In the anostracan and syncarid Crustacea, however, the gnathal segments remained as an independent group between the protocephalon and the thorax. In those crustaceans having a maxillary carapace united with the thorax, the gnathal segments were thereby anchored to the thorax, leaving the protocephalon as the functional head.

It is evident, therefore, that cephalization of the gnathal segments has taken place independently in different arthropod groups, since the tracheate mandibulates cannot be supposed to have been derived from any crustacean having the same type of syncephalon. Among the Crustacea the head of the isopods and amphipods most resembles the insect head, but it includes the segment and appendages of a fifth segment, that of the first maxillipeds. The head of the chilopods has the same segmental composition as that of the insects, as has also the symphylian head. In the pauropods, however, according to Tiegs (1947), only one maxillary segment is contained in the head, and probably the same is true of the diplopods.

Just when in the ancestry of the insects the gnathal appendages were modified for feeding and their segments added to the primitive head we cannot know, since all known fossil insects appear to have

modern heads. In some insect embryos, however, the thorax with its six legs (fig. 1 C) is already differentiated as the locomotor section of the body while the segments of the gnathal appendages (*Gn*) are still a small body section between the blastocephalon and the thorax. If we can trust the embryo, therefore, the insects may have been hexapods before the gnathal segments became a part of the head. In this respect the primitive insects must have resembled an anostracan crustacean (fig. 2 C).

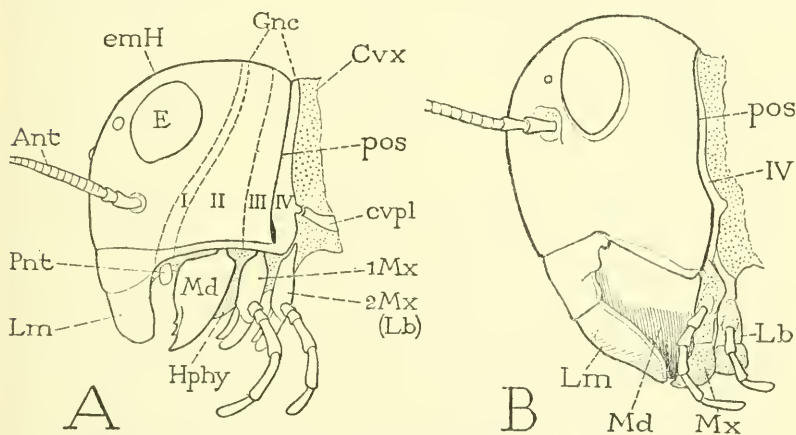


FIG. 3.—Structure and composition of the adult insect head.

A, Diagram of the head showing probable approximate regions derived from the embryonic blastocephalon (*emH*) and four postoral segments (*I-IV*). B, An adult head of generalized structure, intersegmental lines obliterated except for the persisting groove (*pos*) between third and fourth segments.

In conclusion, it appears that we may safely infer from embryonic evidence that the modern insect head has been evolved by the addition of four postoral segments (fig. 3 A) to the primary head (*emH*), represented in the embryo by the blastocephalon. This concept of the composition of the adult insect head is certainly suggested by the normal development of the embryo. It is somewhat disconcerting, therefore, when we read the results of experiments by Haget (1955) on the embryo of *Leptinotarsa*. Haget reports that when the gnathal segments of the embryo are destroyed, a complete cranium is reformed by the cephalic lobe alone. Very probably, however, this is a curious case of regeneration, and has no phylogenetic significance.

The present discussion and the diagram (fig. 3 A) allot no space to a theoretical "superlingual" segment between the premandibular and mandibular segments, the existence of which is generally discredited

by entomologists. Chaudonneret (1956), however, has revived this segment and its supposed homologue, the "paragnathal segment" in Crustacea. Accepting it as a real segment, he points out, explains the appendagelike nature of the paragnaths and superlinguae; but he admits the idea is only a hypothesis.

In the mature insect head (fig. 3 B) the cephalic components have been so completely united that, with the possible exception of a groove (*pos*) around the occipital foramen, no trace is left of the intersegmental lines. It is suggested by Strenger (1942) that the obliteration of the segmental limits is an adaptation to the need of a uniform cranial surface for muscle attachments, which have spread from one segmental area to another. The secondary development of ridge-forming grooves in the head cuticle is a device for strengthening the cranial walls.

That the groove around the occipital foramen, known as the *postoccipital sulcus* (figs. 3, *pos*), is a true intersegmental line is indicated by several structural features. First, it sets off behind it a narrow postoccipital flange on which the membranous neck is attached. Second, it forms a strong internal ridge that gives attachment to the muscles from the thorax that move the head, and this ridge appears to correspond with the intersegmental ridges of the segmental body plates on which are attached the intersegmental dorsal muscles of the trunk. Third, in a head of generalized type of structure, the maxillae are attached on the lower cranial margins *before* the postoccipital sulcus (fig. 3 A, *IMx*), and the labium (*Lb*) is suspended from the postoccipital flange *behind* the sulcus. The postoccipital sulcus, therefore, appears to be the persisting intersegmental groove between the maxillary and labial segments of the head. The labial segment in Symphyla, according to Tiegs (1940), is the last body segment to be added to the head in embryonic development, and the groove before it is the only intersegmental line that remains on the adult head. The postoccipital sulcus is well said by Strenger (1952) to owe its origin to the union of segments, its retention in the adult to its functional importance.

Chaudonneret (1950), in his study of *Thermobia*, admits that the lower lateral parts of the postoccipital sulcus mark the intersegmental line between the maxillary and labial segments. The dorsal part, however, he contends must be the line between the labial segment and the prothorax, because the prothoracic muscles are attached on its internal ridge. This interpretation creates a rather complicated situation, but otherwise it must be assumed that the intersegmental groove between the labial segment and the prothorax has been lost some-

where in the neck, and that the dorsal muscle fibers attached on the head have become continuous through two consecutive segments. The true condition here is hard to understand, and probably has not yet been rightly explained, but it must be noted that muscles from both the head and the prothorax may be attached on the lateral neck sclerites.

Theories of head segmentation, including the disputed question of segments in the blastocephalon, will be discussed in a final section of this paper (p. 38).

II. GENERAL EXTERNAL STRUCTURE OF THE INSECT HEAD

The typical insect head (fig. 4 A) is a craniumlike capsule movably supported on the thorax by a short membranous neck. The head bears the eyes (*E*), the antennae (*Ant*), and the organs of feeding, or *mouth parts*. The last include an upper lip, or *labrum* (*Lm*), a pair of mandibles (*Md*), a pair of maxillae (*Mx*), a lower lip, or *labium* (*B*, *Lb*), and, enclosed between these parts (*D*), a median tonguelike lobe known as the *hypopharynx* (*Hphy*). On the back of the head (*B*) is a large opening (*For*) into the neck, analagous to the foramen magnum of the vertebrate skull, but generally called the *occipital foramen*. The only movable part of the head is the labrum, which is either articulated on the clypeal area (*A*, *Clp*) above it, or suspended from the latter by an ample membranous area, sometimes called the anteclypeus. The labrum is really an appendicular structure provided with four basal muscles, two of which are anterior and two posterior (*C*, *4*), the latter attached on special sclerotizations (*Tor*) known as the *tormae*.

The cranial wall is continuously sclerotized, but it is usually marked by grooves that appear to divide it into specific areas, which the earlier entomologists regarded as sclerites united along "sutures." This concept, however, is now seen to be entirely erroneous, as will be shown in the next section, since the function of the grooves is to form internal strengthening ridges.

Enclosed by the mouth parts of insects such as the cockroach and others that feed on solid foods is a space (fig. 4 D, *PrC*) that serves for the intake of food and its mastication by the mandibles. This space, therefore, has been known as the "mouth cavity" or "buccal cavity" of the insect. However, the true mouth (*Mth*), or opening into the alimentary canal, lies in the inner wall of this cavity. The *preoral food cavity* (*PrC*), therefore, is merely a part of the exterior enclosed between the labrum in front, the labium behind,

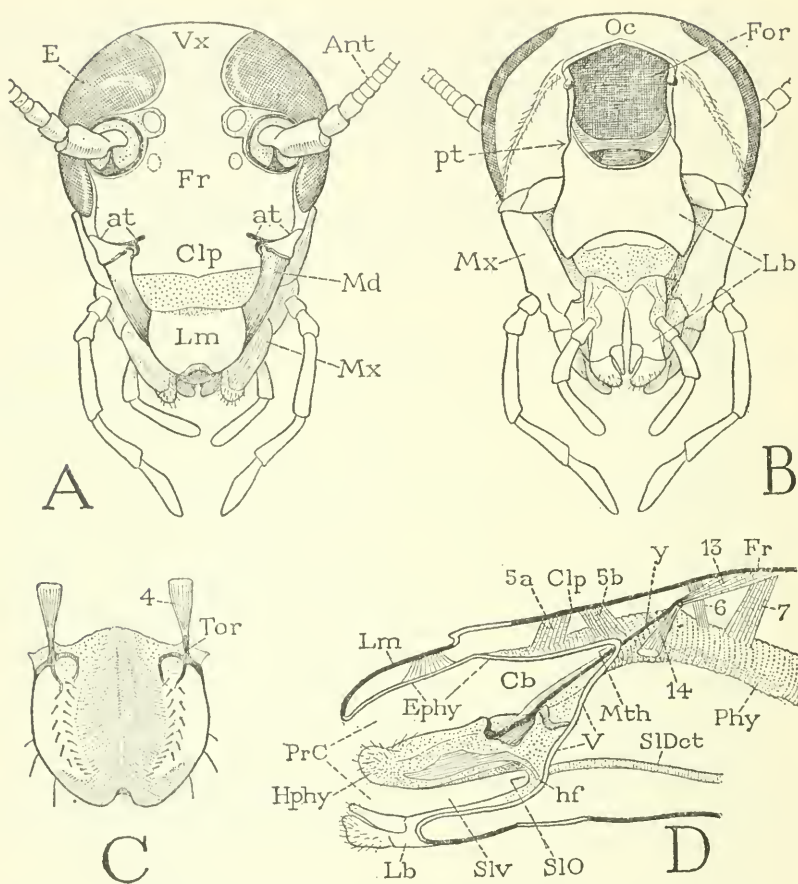


FIG. 4.—The head of a cockroach, *Periplaneta americana*, example of a generalized insect head.

A, Anterior. B, Posterior. C, Labrum, inner surface. D, Section through left side of ventral part of head, turned horizontally.

Ant, antenna; *at*, anterior tentorial pit; *Cb*, cibarium; *Clp*, clypeus; *E*, compound eye; *Ephy*, epipharyngeal surface; *For*, occipital foramen; *Fr*, frons; *hf*, fulcrum point of hypopharynx; *Hphy*, hypopharynx; *Lb*, labium; *Lm*, labrum; *Md*, mandible; *Mth*, mouth; *Mx*, maxilla; *Oc*, occiput; *Phy*, pharynx; *PrC*, preoral cavity; *pt*, posterior tentorial pit; *SIDet*, salivary duct; *SIO*, salivary orifice; *Slv*, salivarium; *Tor*, torus; *V*, ventral wall of head; *Vx*, vertex; *y*, suspensory arm of hypopharynx.

Muscles: 4, posterior muscle of labrum; 5, dilators of cibarium; 6, 7, dilators of pharynx; 13, producer of hypopharynx; 14, reductor of hypopharynx.

and the mandibles and maxillae on the sides. Its inner wall (*V*) is the true ventral wall of the head, and from it arises the median hypopharynx (*Hphy*). The mouth (*Mth*) lies anterior to the base of the

hypopharynx, and behind the latter is the opening (*SIO*) of the salivary duct (*SIDct*).

The hypopharynx is suspended by a pair of lateral rods (*y*) in its wall that enter the head through the mouth angles and give attachment each to a pair of muscles (*I3*, *I4*). It is supported on the labium by a pair of fulcral processes (*hf*) at the sides of the salivary orifice. Between the suspensory rods the front surface of the hypopharynx is somewhat depressed, and forms the floor of a pocket (*Cb*) of the preoral cavity immediately before the mouth. This pocket has long been called the "pharynx," regardless of the fact that it is outside the mouth. Since it serves the cockroach at least as a receptacle for masticated food to be swallowed, the pocket is now generally known as the *cibarium* (*Cb*). It becomes the sucking pump of liquid-feeding insects. Since, however, the cibarium was long ago called the "pharynx," we still use the name "epipharynx" for the anterior or dorsal wall of the preoral cavity (*Ephy*), and call the postoral lobe the "hypopharynx." No one has yet proposed suitable names for these parts. The true pharynx is an anterior part of the alimentary canal (*D*, *Phy*). The salivary passage between the hypopharynx and the labium (*Slv*) into which the salivary duct opens, may be termed the *salivarium*. It is thus seen that the important parts of the insect feeding apparatus lie entirely outside the mouth.

An internal skeletal structure known as the *tentorium* is present in the head of Thysanura and Pterygota. It consists of four apodemal arms, two anterior and two posterior. The posterior arms are usually joined to each other in a bridge through the back of the head, and in the Pterygota the anterior arms are united with the bridge. The points of ingrowth of the arms are marked by depressions in the head cuticle termed the *anterior* and the *posterior tentorial pits* (fig. 4 A, *at*; B, *pt*). The tentorium is highly variable in its structure and degree of development, as will be described in a special section (p. 32).

The position of the head relative to the body axis is variable. When the face is directed forward and the mouth parts hang downward (fig. 5 A) the head is said to be *hypognathous*. This should be the primitive head position since the feeding appendages are modified legs and thus have the same relative position as the thoracic legs. The hypognathous insects are mostly vegetarians that live in the open, feeding on the leaves, sap, or nectar of plants, though some are blood-suckers.

On the other hand, in many insects the head is turned upward on the neck in line with the body axis (fig. 5 B), so that the mouth parts are directed forward, in which case the insect is said to be

prognathous. Since this condition is of common occurrence among insects of various orders, some writers have contended that the primitive insects were prognathous. This, however, seems improba-

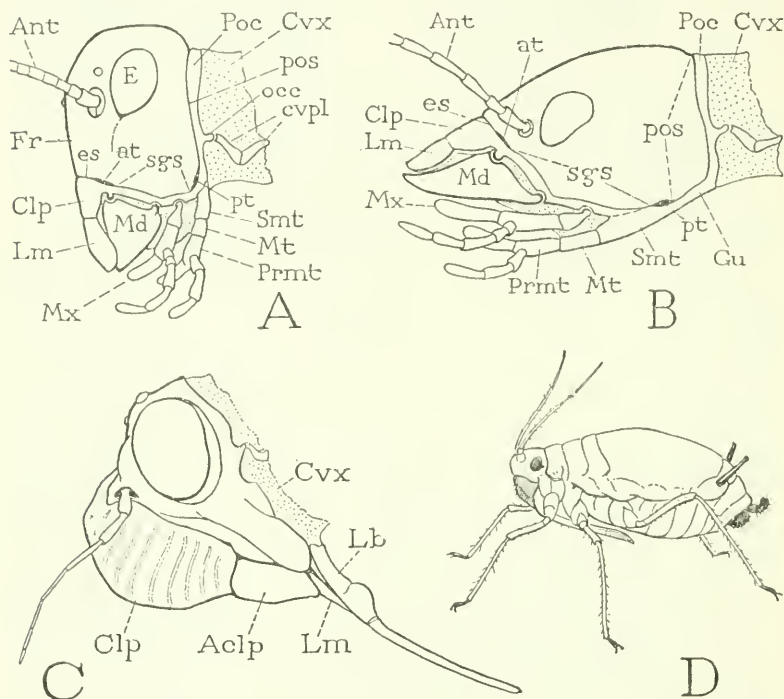


FIG. 5.—Different positions of the head or mouth parts relative to the body.

A, *Hypognathous* position of head, diagrammatic, head vertical, mouth parts hang downward. B, *Prognathous* position of head, diagrammatic, head horizontal, mouth parts anterior. C, *Auchenorhynchous* position of mouth parts, cicada, beak projects from below the neck. D, *Sternorhynchous* position of mouth parts, aphid, beak held against undersurface of thorax when not in use.

Aclp, anteclypeus; *cvpl*, cervical plates; *es*, epistomal sulcus; *Gu*, gula; *Mt*, mentum; *occ*, occipital condyle; *Poc*, postocciput; *pos*, postoccipital sulcus; *Prmt*, prementum; *sgs*, subgenal sulcus; *Smt*, submentum.

Other lettering as on figure 4.

ble, because prognathism involves extensive readjustments in the structure of the head, particularly of the undersurface, which are specializations, and are not the same in different prognathous insects. Furthermore, some insects are prognathous in the larval stage, and revert to the hypognathous condition in the adult. The structural changes correlated with prognathism will be fully discussed in a following section on the back of the head (p. 21). Prognathism,

as pointed out by Walker (1932), is particularly characteristic of carnivorous insects which chase their prey and capture it with their mandibles, of larvae that burrow with their mandibles, as wood-boring beetles, and generally of species that habitually rest on broad surfaces, or lurk in crevices.

Again, the mouth parts may be directed posteriorly, as seen in most Hemiptera (fig. 5 C, D). This condition might be termed *opisthognathous*, except for the fact that such insects have a beak instead of jaws. More literally, therefore, they are *opisthorhynchous*. Some, such as the cicada (C), in which the beak slopes posteriorly and downward apparently from the neck (*Cvx*) are termed *auchenorhynchous*. Others, such as the aphids (D) that hold the beak when not in use close against the undersurface of the body, are termed *sternorhynchous*. Since the beak of the aphid must be directed downward for feeding, it is evidently turned backward for convenience when not in use.

III. THE SO-CALLED "SUTURES" AND THE SURFACE AREAS OF THE HEAD

The cuticle of the insect head wall is marked by various impressed lines that divide the cranial surface into specific areas. The early entomologists, being acquainted with vertebrate anatomy, naturally saw in the areas of the insect head a likeness to the centers of ossification in the vertebrate skull united along sutures. It was a simple matter then to give names to the supposed sclerites and sutures of the insect cranium. We still use these same names, but we now realize that the sclerotization of the head cuticle is continuous, and that the so-called "sutures" are mostly lines where the cuticle has been in-folded to form internal strengthening ridges or to give attachment to muscles. The external grooves, if we must have a Latin name for them, are better termed *sulci*. Strenger (1942, 1950, 1952) has strongly emphasized the functional significance of the cranial sulci (though she calls them *Nähte*) in that they form internal ridges for strengthening the head wall along lines of mechanical stress. The same applies to most of the "sutures" in other parts of the insect skeleton. Scientific terms should express facts rather than perpetuate errors. When errors become chronic, however, they are hard to eradicate.

There are, of course, always exceptions to any general rule. In some insects there is a true median suture on the under side of the head where the extended lateral walls have grown together. Also,

there is the so-called "epicranial suture," which is neither a suture nor a ridge-forming groove, but a pre-formed line of weakness where the head cuticle will split at ecdysis, though it may be retained on the adult head. These exceptional features will be fully discussed later.

The ridge-forming sulci of the head are variable and any of them may be absent. Since they are mechanical adaptations to resist strains, however, some of them are fairly constant in occurrence and position in response to general needs for strengthening the head wall. The surface areas separated by the sulci are given names for descriptive purposes, but in no case do they represent primitive head sclerites. Some named areas not demarked by sulci are defined on a topographical basis, and, where sulci are not present, the cranial sclerotization is continuous.

The groove perhaps most commonly present on the head is one that crosses the lower part of the face and forms a strong internal brace between the anterior articulation of the mandibles. This is the *epistomal sulcus* (fig. 6 A, *es*). Incidentally it separates a distal facial area, the *clypeus* (D, *Clp*), from the frontal area (*Fr*) above it, for which reason it is known also as the *frontoclypeal sulcus*. In some insects this sulcus is arched upward into the facial region. In others it is incomplete, and it may be absent even in insects with strong, jawlike mandibles, in which case the frontal and clypeal regions are continuous (fig. 4 A).

The head area known as the *frons* (fig. 6 D, *Fr*) can be defined only as the facial region between the compound eyes and the antennae, extending down to the clypeus. In the textbooks, however, it has commonly been defined as the area between the arms of the ecdysial cleavage line (C, *CL*). These lines, however, as will later be shown (fig. 7), are so variable in the position they take that they define no specific part of the face. Moreover, they are present in only a few adult insects (fig. 6 C). Dorsally the frons passes without interruption into the recurved top of the head known as the *vertex* (D, E, *Vx*). The vertex and the dorsal part of the frons are sometimes marked by a *midcranial sulcus* (A, *mcs*), and a pair of lateral *temporal sulci* (*ts*) convergent between the compound eyes.

Below each compound eye there is often a *subocular sulcus* (fig. 6 A, B, *sos*), which when present separates the frons from the lateral head wall termed the *gena* (D, E, *Ge*). The gena extends back to the postoccipt (E, F, *Poc*). For descriptive purposes its posterior part is distinguished as the *postgena* (fig. 9 A, *Pge*). Since the mandibles and the maxillae are articulated on the lower margins of the genae,

these margins are commonly reinforced by submarginal internal ridges formed by a *subgenal sulcus* on each side of the head (fig. 6 A, B, *sgs*). This sulcus is generally continuous from the epistomal sulcus in front to the postoccipital sulcus (*pos*) behind, and sets off a

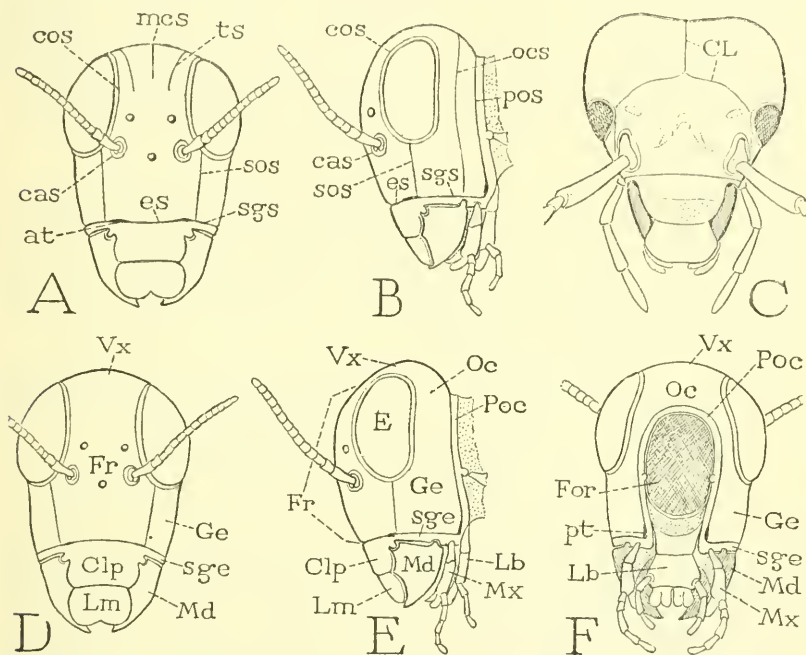


FIG. 6.—The common external sulci and defined areas of the adult insect head, diagrammatic except C.

A, B, The impressed lines, or sulci (generally called "sutures"). C, *Anisolabis maritima*, Dermaptera, example of ecdysial cleavage line (*CL*) retained on adult head. D, E, F, The commonly defined areas of the head.

Sulci on A, B: *cas*, circumantennal; *cos*, circumocular; *es*, epistomal; *mcs*, midcranial; *ocs*, occipital; *pos*, postoccipital; *sgs*, subgenal; *sos*, subocular; *ts*, temporal.

Head areas on D, E, F: *Clp*, clypeus; *Fr*, frons; *Ge*, gena; *Lm*, labrum; *Oc*, occiput; *Poc*, postocciput; *sge*, subgena; *Vx*, vertex.

Other lettering as on figure 4.

narrow marginal strip, the *subgena* (D, E, F, *sge*), from the main genal area above it. The part of the subgena over the mandible is distinguished as the *pleurostoma*, and that behind the mandible as the *hypostoma*. The corresponding parts of the subgenal sulcus are correspondingly termed *pleurostomal* and *hypostomal*. As will be seen later this distinction is only one of convenience for descriptive purposes. In some cases the subgena is obliterated by coincidence of

the subgenal ridge with the lower genal margin, and the ridge may be absent.

On the back of the head the postoccipital sulcus (fig. 6 B, *pos*), as already described, sets off the narrow postocciput (E, F, *Poc*) that arches over the occipital foramen (F, *For*). Present particularly among the Orthoptera, but not in all of them, is an *occipital sulcus* (B, *ocs*) that crosses the top of the head behind the compound eyes and extends downward on the sides. The area behind this sulcus is known as the occiput whether the sulcus is present or not (E, F, *Oc*).

Closely surrounding the compound eye is usually a *circumocular sulcus* (fig. 6 A, B, *cos*) that strengthens the cranial rim of the eye, and in some cases forms a deep internal flange protecting the inner part of the eye. Likewise the rim of the membranous antennal "socket" is generally strengthened by a surrounding ridge formed by a *circumantennal sulcus* (*cas*).

Finally, various linear grooves may occur on the head that have no relation to one another in different insects, being independent adaptations to some special need of the particular species.

There is one line on the head that must be given special attention. This is the so-called "epicranial suture," which is no suture at all and does not form an internal ridge. It is merely a pre-formed line of weakness where the cuticle will split at ecdysis, as has been shown by DuPorte (1946) and by the writer (1947). The line is properly, therefore, an *ecdysial cleavage line*, characteristic of immature insects, and retained in only a few adults. Yet it has long been described as an important structural feature of the insect head.

The cleavage line on the head has typically the form of an inverted Y when seen from in front (fig. 7 A, B, *CL*), with the stem on the top of the head and the arms spreading downward. At ecdysis the whole line breaks open (C, D, E), and the stem is then seen to be continuous from the median cleavage line on the back of the thorax (E).

The facial area between the arms of the cleavage line is often identified as the frons, but these lines do not consistently define any anatomical part of the head, since they vary greatly in their extent and position in different insects. Typically they extend down to the clypeus, but in some insects they turn laterally and at ecdysis the splits cut through the compound eyes (fig. 7 E), in others the arms of the Y end between the eyes and the antennae (A), in still others they go to the antennal sockets (B, G) or below them, and finally they may extend clear through the clypeus (D). The part of the head wall

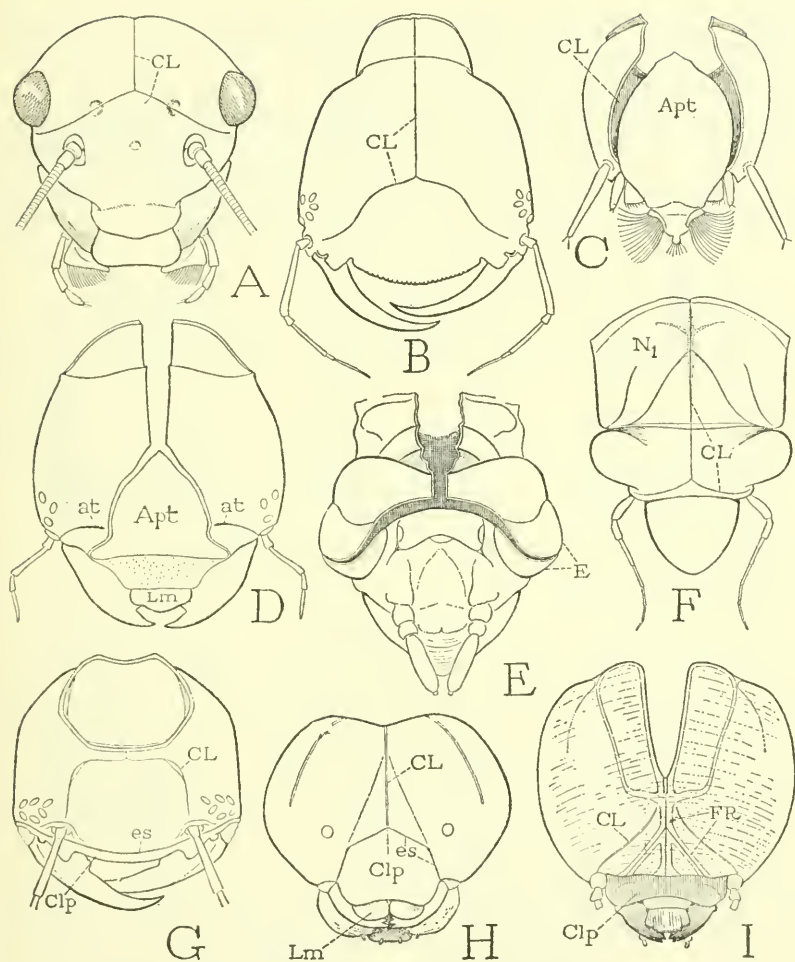


FIG. 7.—Examples of the ecdysial cleavage line on the nymphal and larval head.

A, Head of an ephemeropterous larva. B, *Dytiscus marginalis* larva, Coleoptera. C, *Anopheles farauti*, Culicidae; head exuviae. D, *Chauioides* sp., Megaloptera, head exuviae. E, *Opisthogomphus morrisoni*, Odonata, exuviae of head and thorax. F, *Magicada septendecim*, Homoptera, nymphal head and prothorax. G, *Hydrophilus* sp., Coleoptera, head of larva. H, *Vespula* sp., Hymenoptera, head of larva. I, *Chalcophora* sp., Coleoptera-Buprestidae, head of larva.

cut out at ecdysis, therefore, cannot be identified as the frons; it may be termed the *cephalic apotome* (C, D, *Apt*). Moreover, the cleavage line does not always fork. In some hymenopterous larvae it goes straight down through the middle of the face (H), and at ecdysis the head cuticle spreads apart in a wide V-shaped opening. Many caterpillars, except at the last ecdysis, shed the head capsule

entire. The six common types of ecdysial cleavage in the head cuticle are shown diagrammatically on figure 8.

The area between the arms of the cleavage line is sometimes reinforced by ridges that might easily be mistaken for the cleavage lines when the latter are faintly marked. In a wood-boring buprestid beetle larva, for example (fig. 7 I) an elaborate set of ridges (*FR*) in the otherwise weak cuticle of the head braces the clypeus for support

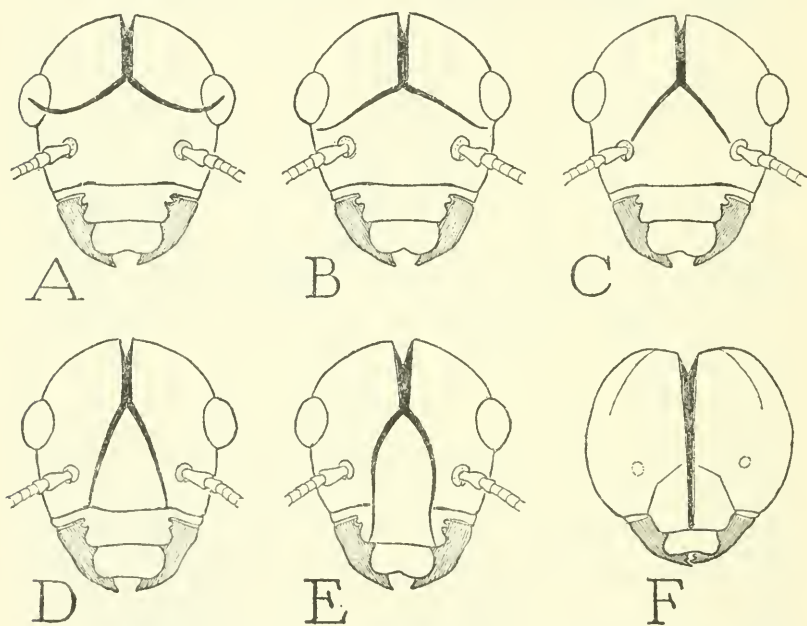


FIG. 8.—Diagrams of larval heads showing various positions of the ecdysial splits along the arms of the cleavage line.

of the mandibles. The true cleavage lines (*CL*) lie laterad of these ridges.

In a few insects, particularly in the Dermaptera and among the Orthoptera, the cleavage line is retained on the head of the adult. Usually it is a faint replica of the line on the nymphal head (fig. 6 C), but in *Forficula* Strenger (1950) notes it forms an internal ridge, which is particularly developed as a comb on the vertex. The retention of the cleavage line on the adult head might be explained as a relict from times when the adult ancestors of the insects periodically moulted and shed the cuticle, as do the adults of modern Thysanura and most other arthropods. Adult moulting occurs now among the winged insects only in the Ephemeroptera, and then but once at an

early stage. In the adult insect, as in the larva, ridge-forming grooves on the head sometimes resemble the cleavage line, and have been mistaken for the "epicranial suture." On the adult head of the water beetle *Hydrophilus* a Y-shaped groove exactly duplicates a typical cleavage line, but it is formed by a midcranial ridge that meets the ridge of the angulated epistomal sulcus.

IV. THE POSTERIOR HEAD STRUCTURE

The modifications of the insect head hardest to understand, and the most confusing to taxonomists, are those that affect the posterior surface, particularly when this surface becomes ventral in prognathous species.

The head of an acridid grasshopper is a good example of the primitive structure of the head and its position on the thorax, since the subgenal margins are approximately horizontal (fig. 6 E) and the occipital foramen occupies a large part of the posterior head surface (F). The labium hangs from the neck between the posterior tentorial pits. By contrast, in most of the higher orders of insects the foramen is much contracted by shortening from below (fig. 10). In a simple hypognathous head of this type (fig. 9 A) the hypostomal margins of the cranium have been drawn upward on the rear surface of the head. The hypostomal sulci (*hs*) extend to the tentorial pits (*pt*) as usual and become continuous with the postoccipital sulcus (*pos*) over the occipital foramen. The postocciput and the hypostomata thus form a continuous marginal band of the cranium. The labium still hangs from the neck approximately between the tentorial pits, but both the labium and the maxillae are now suspended from the back of the head. An example of this type of head structure is seen in the hymenopteron *Xyela* (B), except that the base of the labium has lost its association with the tentorial pits. Other less diagrammatic examples of the same essential structure are seen in the beetle larvae *Popillia* (C) and *Melandrya* (D), and in an adult Myrmelionid (E).

On the figures accompanying the following discussions it may seem inconsistent that the basal plate of the labium in some cases is labeled the postmentum (fig. 9 B, D, E, *Pmt*), in others the submentum (C, *Smt*). The labial sclerotization fundamentally consists of a *prementum* and a *postmentum*, but the postmentum is often subdivided into a *mentum* and a *submentum*. The basal plate, therefore, may be either a postmentum or a submentum. The prementum is always to be identified by the attachment on its base of a median

retractor muscle (E, *rprmt*). Incidentally it may be noted that the word *mentum*, meaning "chin," is incongruously applied to any part of the labium, or "lip," but we cannot stop here to reform this accepted terminology.

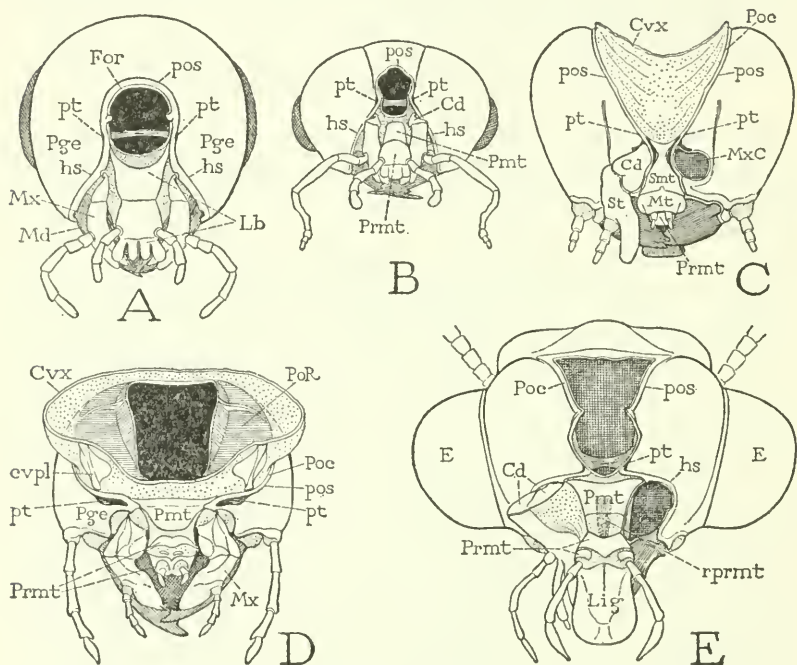


FIG. 9.—Examples of simple modifications of the relatively generalized structure (A) of the back of the head.

A, Posterior surface of a head having a relatively generalized structure associated with a centrally placed occipital foramen. B, *Xyela minor*, adult, Hymenoptera. C, *Melandrya*, larva, Coleoptera. D, *Popillia japonica*, larva, Coleoptera. E, A myrmelionid adult, Neuroptera.

A series of modifications in the posterior surface of the head, departing from the relatively generalized structure shown at A of figure 9, begins with the formation of a pair of opposing lobes of the hypostomata (fig. 10 B, *HL*) that intrude between the occipital foramen and the base of the labium. A union of these lobes then produces a *hypostomal bridge* (D, *HB*) ventral to the tentorial pits (*pt*). A suggestion of the lobes is seen on the head of *Pteronidea ribesii* (A), but they are fully developed on the head of a caterpillar (C). The bridge is a narrow bar in *Tabanus* (E); in other Diptera it becomes a wide plate, as in the asilid (F), and in a muscoid

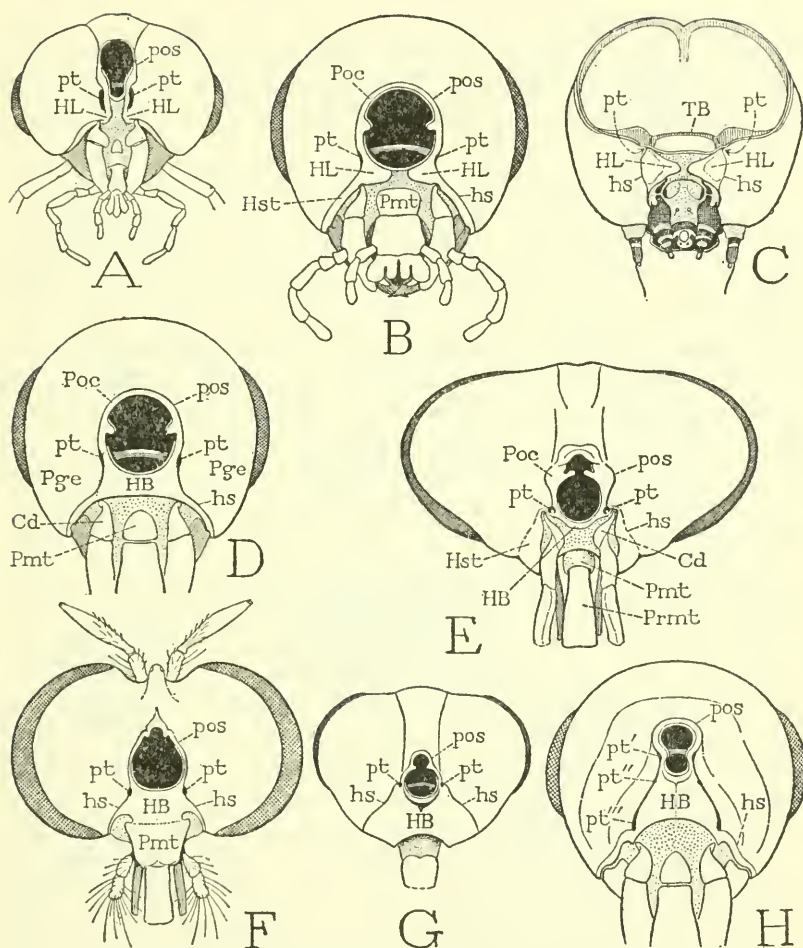


FIG. 10.—Formation of a hypostomal bridge between the occipital foramen and the labium.

A, *Pteronidea ribesii*, Hymenoptera, hypostomal lobes (HL) small. B, Diagram of hypostomal lobes enlarged. C, *Malacosoma americanus*, larva, Lepidoptera with hypostomal lobes. D, Diagram, hypostomal lobes united in a bridge (HB). E, *Tabanus sulcifrons*, Diptera, bridge narrow. F, *Deromyia discolor*, Diptera, bridge enlarged. G, *Calliphora* sp., Diptera, bridge still larger. H, *Pelicanus* sp., diagrammatic, Hymenoptera, bridge limited by the elongate posterior tentorial pits.

(G) it covers the whole ventral part of the head wall. Since the hypostomal sulci (D, *hs*) are continuous with the postoccipital sulcus (*pos*), the hypostomal bridge is continuous dorsally with the postocciput (*Poc*), and ventrally with the hypostomata.

An unusual condition is seen in the hymenopterons *Proctotrupes* and *Pelecinus* (fig. 10 H). The hypostomal bridge here appears to be limited laterally by the ventrally elongate posterior tentorial pits, from which are given off separately (*pt'*, *pt''*, *pt'''*) three parts of the tentorium.

By another line of modifications the posterior wall of the head becomes closed between the occipital foramen and the base of the labium by a bridge that unites the postgenae. This *postgenal bridge* has its inception in a pair of median lobes of the postgenae (fig. 11 A, F, *PgL*) below the tentorial pits, or distal to them in prognathous species. If a hypostomal bridge is already present (A, *HB*) it may be compressed between the postgenal lobes, as in the honey bee (B). A union of the lobes, as in the wasp (C), then establishes a postgenal bridge (*PgB*) between the foramen and the labium that has supplanted the hypostomal bridge. The bridge itself may then be lengthened downward (D) until it forms a large area on the back of the head, as seen in the hymenopteron *Pristocera* (E). The tentorial pits here retain their primary relation to the occipital foramen, but the labium becomes far removed from the pits by intervention of the lengthened postgenae. The postgenal bridge differs from the hypostomal bridge in that it has no connection with the postocciput (C, *Poc*), and is continuous only with the postgenae.

In other cases, particularly in nematocerous fly larvae in which there is no hypostomal bridge, a postgenal bridge may be formed by direct confluence of a pair of hypostomal lobes (fig. 11 F, *PgL*). In the same way the bridge becomes lengthened (G) between the foramen and the mouth parts. The median postgenal suture (D, *ms*) is usually retained as a groove, but it may be partly suppressed (G), and in others (H, I) it becomes entirely obliterated by complete union of the postgenae. The broad enclosure of the back of the head in *Notonecta* (H) and *Naucoris* (I) is evidently a postgenal bridge, since it is continuous with the postgenae and not with the postocciput.

In many insects, especially prognathous larval forms, the tentorial pits lie near the center of the posterior or under surface of the head (fig. 12, *pt*). Inasmuch as the pits retain their primitive association with the base of the labium (A, B) the condition here must therefore be interpreted as brought about by a lengthening and approximation of the postgenae *proximal* to the pits, since the lower ends of the postoccipital sulcus when present (A, *pos*) are continued to the pits. In some beetle larvae, as in the carabids (C, D), the postgenae are farther lengthened *distal* to the pits, and come together medially,

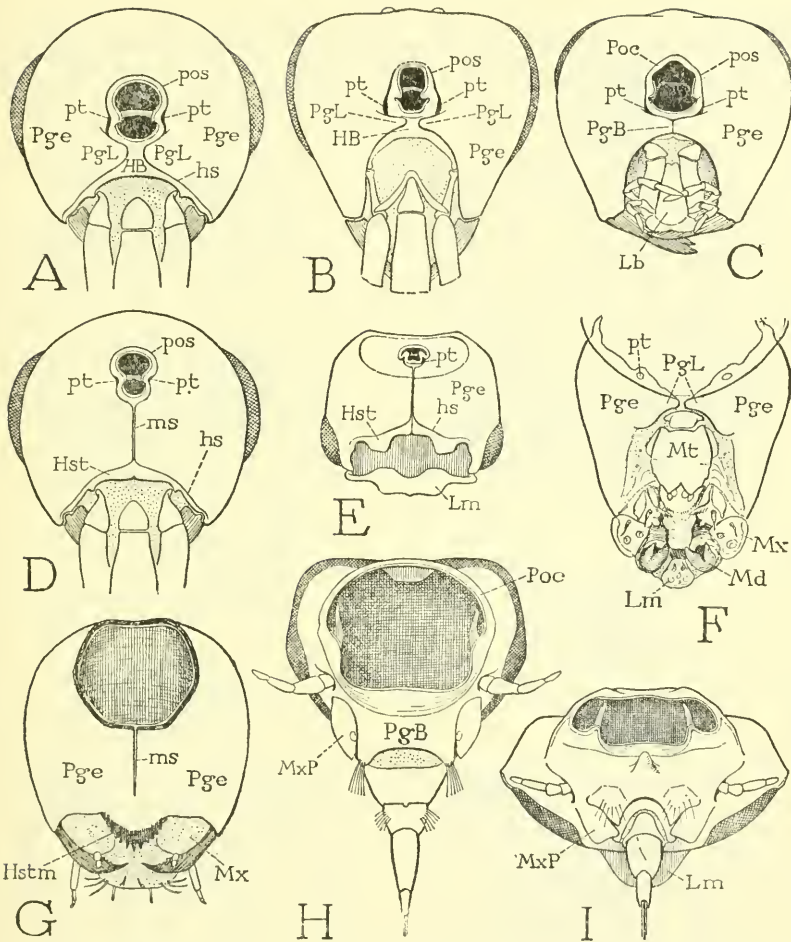


FIG. 11.—Formation of a postgenal bridge between the occipital foramen and the labium.

A, Postgenal lobes (*PgL*) encroaching on the hypostomal bridge (*HB*), diagrammatic. B, *Apis mellifera*. C, *Vespula maculata*, postgenal lobes united in a bridge (*PgB*). D, Postgenal bridge lengthened, diagrammatic. E, *Pristocera armifera*, Hymenoptera. F, *Olbiogaster* sp., a primitive dipterous larva with postgenal lobes not united (outline from Anthon, 1943). G, *Chironomus plumosus*, larva, Diptera, postgenal suture (*ms*) partly suppressed. H, *Notoxecta variabilis*, Homoptera, postgenal bridge entire. I, *Naucoris cimicoides*, Homoptera.

almost (C) or entirely (D) suppressing the submentum (*Smt*) between them. In this case the head has been lengthened in both directions relative to the pits.

Finally, we may start again with a fairly generalized head struc-

ture, such as that of the larva of *Silpha* (fig. 13 A), and trace the evolution of a head plate known as the *gula*. In the silphid larva the basal plate of the labium (*Smt*) is attached on the cranial margins

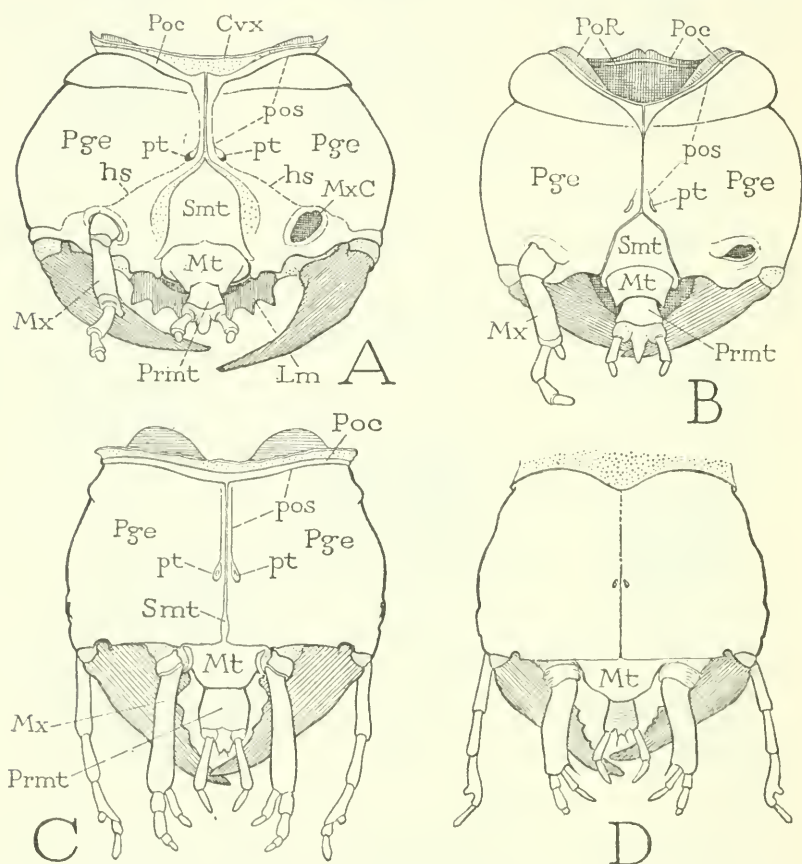


FIG. 12.—Coleopterous larvae with postgenae lengthened and united proximal to the tentorial pits (A, B), or also distal to the pits (C, D).

A, *Thinopinus pictus*, Staphylinidae. B, *Staphylinus* sp. C, *Scarites* sp., Carabidae. D, *Eufcronia stygica*, Carabidae.

immediately distal to the tentorial pits (*pt*). Proximal to it the lower ends of the postocciput are united in a median sclerotization (*Gu*) in the ventral wall of the neck. This is the beginning of the gula. In many beetles, both larval and adult (B, C) and in some other insects (D), the gula becomes lengthened distally accompanying a lengthening of the postgenae proximal to the tentorial pits. As the gula enlarges, the tentorial pits (B, C, D, *pt*) maintain their primary

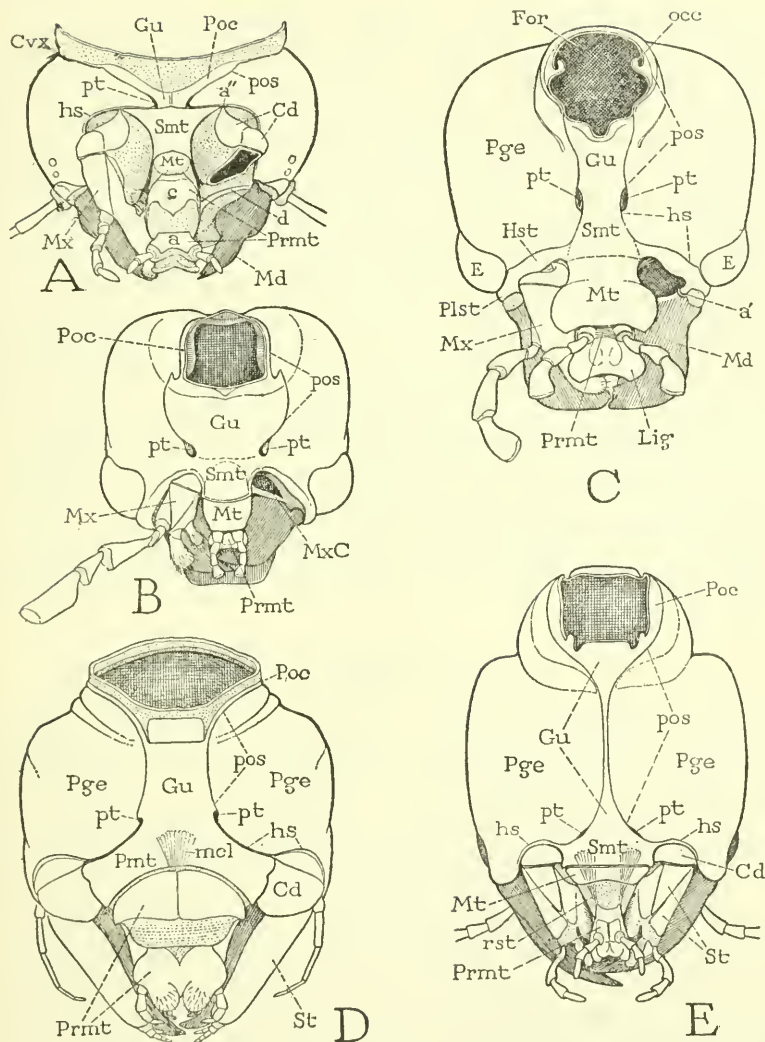


FIG. 13.—Formation of the gula. Tentorial pits (*pt*) at base of labium, under surface of head lengthened proximal to pits.

A, *Silpha* sp., larva, Coleoptera, gula (*Gu*) a ventral sclerotization of the neck, proximal to the tentorial pits (*pt*). B, *Melandrya striata*, adult, Coleoptera, gula enlarged. C, *Epicauta marginata*, adult, Coleoptera, gula elongate, united with base of labium (*Smt*). D, *Corydalus cornutus*, larva, Megaloptera. E, *Staphylinus cinnamopterus*, adult, Coleoptera, gula compressed between postgenae (*Pge*).

relations to the base of the labium, but the gula and the labium become sclerotically continuous. The labiocular plate has been termed the "gulamentum," but the labial part involved is either the post-

mentum or the submentum, according to the number of subdivisions in the labium. The original line of confluence between the gula and the labium must be between the tentorial pits, as shown by the silphid larva (A). The gula is usually continuous proximally with the post-occiput, since actually it is merely a ventral sclerotic union of the lower ends of the postocciput. The general tendency of the postgenae to come together ventrally on the prognathous head now in some cases reduces the gula to a narrow median strip between the postgenal margins (E, *Gu*), and may proceed so far as to eliminate the gula. The line of union between the postgenae is commonly termed the "gular suture," though really it is a *postgenal suture*. DuPorte in a recent paper (1960) gives a good comparative account of the gula.

A most unusual gular condition is present in the head of a soldier termite (fig. 18 A). The long gula is here limited by lateral grooves (*pt*) continuous from the postoccipital sulcus (*pos*), which superficially appear to be parts of the latter as in other insects. In the termite, however, these grooves are the greatly drawn-out tentorial pits, from which is inflected internally the long, tentlike tentorial bridge (C, *TB*).

V. THE ANTENNAE

The antennae are segmented appendages of the head characteristic of the trilobites and of all the mandibulate arthropods except the Protura, but they are absent in the chelicerates. They are freely movable by basal muscles arising in the head, and ordinarily have only a sensory function, though in the nauplius larvae of Crustacea they serve temporarily for swimming, and in the barnacles for attachment. The antennae are always of postocular origin in the embryo, and receive their innervation from the second, or deutocerebral, brain centers. Being sensory organs, however, principally tactile and olfactory, they commonly assume a facial position in postembryonic stages, where they more effectively serve as feelers or as odor receptors.

An antennal *segment*, as a leg segment, must be defined as a section of the appendage individually muscled by muscles inserted on its base, arising in the segment proximal to it, except that the muscles of the basal segment arise in the head. Segments, however, are often divided into nonmuscled subsegments, which are thus not to be confused with true segments, though they are usually counted as such in enumerating the parts of an appendage.

Among the hexapods the antennae are of two types of structure,

differing in the number of segments they contain. In the entognathous apterygotes (Collembola and Diplura) the antennae vary in length, but are fully segmented and each segment is individually muscled (fig. 14 A). This type of antenna is characteristic also of the chilopods, diplopods, pauropods, symphylans, and some crustaceans such as the copepods and ostracods. It therefore represents the primitive arthropod antenna. In the Thysanura and Pterygota, on the other hand, there are muscles only in the basal segment (B) inserted on the small second segment (*Pdc*). The rest of the antenna in these insects is a *flagellum* (*Fl*) of various lengths subdivided into nonmuscled annuli.

Imms (1939), who first pointed out this difference in the arthropod antennae, distinguished the two kinds as "segmented" and "annulated" antennae, but he held that the flagellar annuli are primitive segments which have lost their muscles. The two antennal types have been described also as "muscled" and "nonmuscled," and made a basis for dividing the mandibulate arthropods into Myocerata and Amyocerata (Remington, 1955). However, since the number of annuli in the flagellum varies from one to many, it is evident that the flagellum represents a single segment variously subdivided. This interpretation follows also from Imms' (1940) observation that the growth of a fully segmented antenna proceeds by division of the apical segment, while growth of the flagellum results from subdivision of the basal annulus, or sometimes by division of the intermediate annuli. The same thing has been noted by other writers. Lhoste (1942), for example, shows that the antennal flagellum of *Forficula* increases during growth from 8 to 14 annuli by division of the basal annulus. The thysanuran-apterygote antenna, therefore, has not more than three true segments, the third of which is usually a multiannulate flagellum. The first and second segments are muscled.

The typical thysanuran and pterygote antenna (fig. 14 B) is a slender elongate appendage composed of three parts, a basal stalk, or *scape* (*Scp*), a small middle piece, or *pedicel* (*Pdc*), and an annulated *flagellum* (*Fl*) of variable length. The scape is set on a small membranous area of the head wall with a reinforced margin, and is pivoted, usually from below, on a marginal point, the *antennifer* (*af*). The antenna as a whole is thus freely movable in all directions, and is provided with basal muscles inserted on the scape. The antennal muscles in some insect larvae and in other arthropods arise on the head wall, but in most insects they arise on the dorsal arms of the tentorium where these arms make contact with the head wall.

The only intrinsic muscles of the antenna are those in the scape inserted on the base of the pedicel. The flagellum is thus moved by the pedicel muscles, and the pedicel might therefore appear to be a

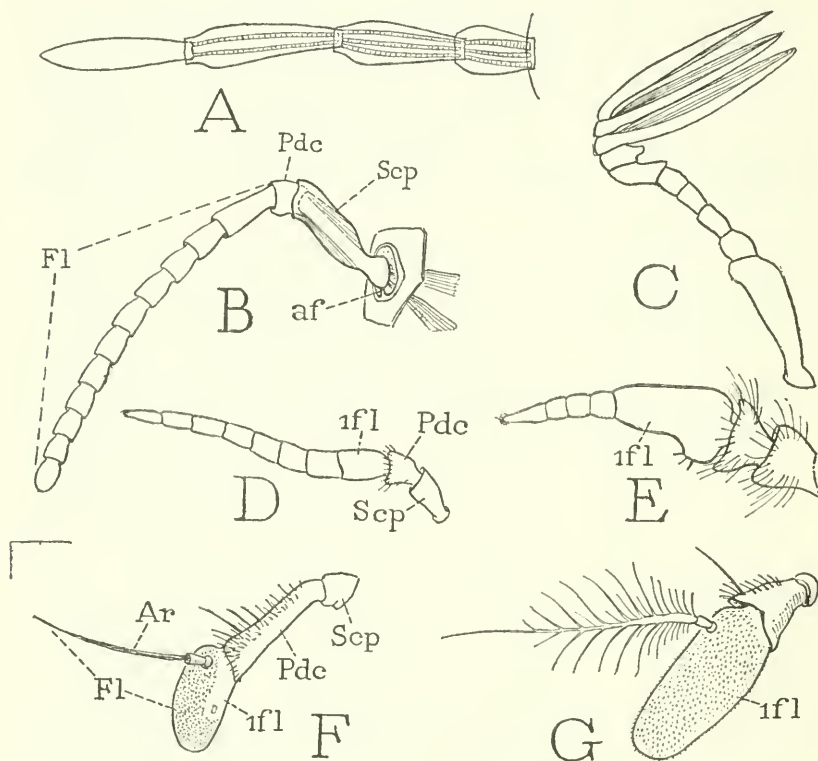


FIG. 14.—Types of adult insect antennae.

A, *Isotoma palustris*, Collembola (adapted from Imms, 1939). B, Diagram of typical thysanuran-apterygote antenna. C, *Leucopoelea albescens*, lamellicorn beetle. D, *Xyloma tenthredinoides*, Diptera-Xylomyidae. E, *Tabanus affinis*, Diptera-Tabanidae. F, *Archytas apicifer*, Diptera-Tachinidae. G, *Sarcophaga bullata*, Diptera-Sarcophagidae.

basal annulus of the flagellum. It is noted by Imms (1940), however, that growth of the antenna never involves subdivision of the pedicel. The pedicel contains an elaborate sense organ known as the organ of Johnston, so it is probable that the pedicel itself is a segment from which the muscles of the flagellar segment have been eliminated. The flagellar units vary in size from short annuli to long sections. If we are not too particular about hybridizing words, they may be

termed *flagellomeres*, as suggested by Imms (1940), but they are *not* "antennal segments."

Among adult Pterygota the antennae take on a great variety of forms, produced chiefly by modifications of the flagellum, or by a differentiation of its annuli. Typically the flagellum is slender and cylindrical (fig. 14 B), but it may be club shaped, or extended as a long, tapering filament. In the lamellicorn beetles some of the distal annuli are produced at right angles to the shaft as overlapping leaf-like plates (C). A particularly specialized type of antenna is that of the muscoid flies. The first annulus of the flagellum has a tendency to be larger than the others (B, D). The enlargement is much exaggerated in a tabanid fly (E, *1fl*). In the muscoid antenna (F, G) this flagellomere becomes a large oval lobe (*1fl*) borne on the pedicel, and the rest of the flagellum is reduced to an *arista* (*Ar*) consisting of two small basal annuli, and a long, tapering, simple or usually branched distal shaft.

The antennae of holometabolous larvae are often so different from those of the adult that they appear to be special larval organs rather than developmental stages of the adult antennae. It is principally among the Neuroptera that the larval antennae resemble adult antennae in having a multiannulate flagellum (fig. 15 A), though in many species they are reduced to three small units. Antennae of four or five units occur in the Megaloptera (B) and in Cantharidae, Dytiscidae, and Hydrophilidae among the Coleoptera, but the antennae of most larval beetles are very small, three-segmented organs (F). Similarly the antennae of lepidopterous larvae (D) have only three segments, the third being a mere apical lobe on the second (E). Among the nematocerous Diptera the larval antennae are always short, but are variable. In *Chironomus* the antenna (C) may have three short apical units on a long base, but in the mosquito larva the very small antenna (G) is undivided. In the higher Hymenoptera the larval antennae are represented by only slight swellings or mere discs of the head wall. In the muscoid fly larva the antennae are entirely eliminated externally, being formed in a pair of long sacs from the frontal region of the head that extend back into the thorax.

When the larval antenna is greatly reduced in size, the succeeding pupal antenna develops either beneath the cuticle of the head, or more commonly in a pocket of the epidermis beneath the larval antenna, usually with its tip in the latter. In the mosquito, for example, as shown by Imms (1908) the pupal antenna is formed in a deep pocket of the head, but has no connection with the larval organ.

On emergence of the pupa the new antenna (fig. 15 H) is five times the length of the larval antenna (G), and is distinctly differentiated into scape, pedicel, and a multiannulate flagellum, but its surface is entirely devoid of hairs. During the pupal stage, the epidermis con-

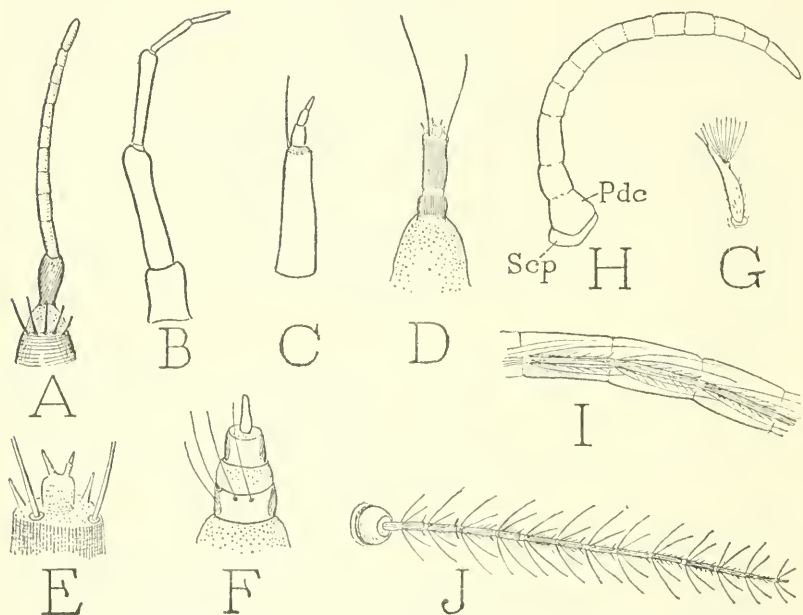


FIG. 15.—Examples of larval antennae, and developmental stages of a mosquito antenna.

A, *Palparcus* sp., Neuroptera-Myrmelionidae. B, *Corydalus cornutus*, Megaloptera. C, *Chironomus plumosus*, Diptera-Chironomidae. D, *Bombyx mori*, silkworm. E, Same, apical part of antenna. F, *Trogoderma* sp., Coleoptera-Dermestidae. G, *Culex* sp., mosquito, left antenna of larva, dorsal. H, Same, pupal antenna, same magnification as G. I, Same, part of pupal antenna with adult antenna formed inside the cuticle. J, Same, adult female antenna, same magnification as G and H.

tracts to a slender, jointed shaft within the cuticle (I), having all the hairs and bristles of the adult antenna (J).

VI. THE TENTORIUM

The tentorium is an internal cuticular framework of the head of ectognathous insects formed by ingrowth and union of four apodemal arms from the exoskeleton. Two of the arms are anterior, and two posterior. The posterior arms arise at the lower ends of the postoccipital sulcus and usually unite with each other to form a transverse

bridge through the back of the head. The anterior arms are variable in their points of origin, but they project posteriorly through the head and in pterygote insects unite with the posterior bridge. The term *tentorium*, meaning a "tent," seems curiously inappropriate for this structure, but in some of the lower insects the arms are united in a central plate, which might suggest a canopy supported on four stays. Though the tentorium varies much in form and degree of development, the name has become fixed in entomological nomenclature. The points of ingrowth of the four tentorial arms are marked externally on the head by depressions known as the *anterior* and *posterior tentorial pits*. Functionally the tentorium gives attachment to the ventral muscles of the mouth parts, and, when strongly developed, probably serves to brace the lower edges of the cranial walls.

To understand the origin and evolution of the insect tentorium we must revert to the myriapods. A comparable structure is not present in the entognathous hexapods—Protura, Collembola, and Diplura. In the chilopods a pair of plates in the ventral head wall lies before the mandibles between the lateral cranial margins and the hypopharynx (fig. 16 A, B, *hF*). These plates are the *kommandibulares Gerüst* of German writers, but since their relation to the hypopharynx is more intimate than that with the mandibles, they may be termed the *hypopharyngeal fulturæ*. From each plate is given off at the side of the hypopharynx an apodemal arm (*Ap*) that extends posteriorly within the head. In *Scutigera* (A) the inner ends of the arms support a wide sheet of soft tissue (*Lg*) from which are given off the ventral muscles (*mcls*) of the mouth parts. In *Lithobius* (B) the apodemal arms are connected merely by a membranous bridge (*Lg*), and most of the muscles have been taken over by the apodemes. In the diplopods premandibular ventral sclerites are present, but the apodemes are less developed than in the chilopods. In Symphyla (C) the supporting sclerites are absent; the long muscle-bearing apodemes (*Ap*) arise at the base of the hypopharynx, and have no connection with each other.

When we turn now to the Thysanura it is seen that in the Machilidae (fig. 16 D) two long apodemes (*AT*) arise ventrally mesad of the mandibles and extend posteriorly and dorsally in the head. In addition, however, a transverse bar (*TB*) forms a bridge through the back of the head. Here, therefore, are the elements of the pterygote tentorium, and there can be little doubt that the anterior arms (*AT*) are homologues of the ventral head apodemes of the chilopods and symphylans. In the Lepismatidae the structure becomes more elaborate by the union of the anterior arms in a broad

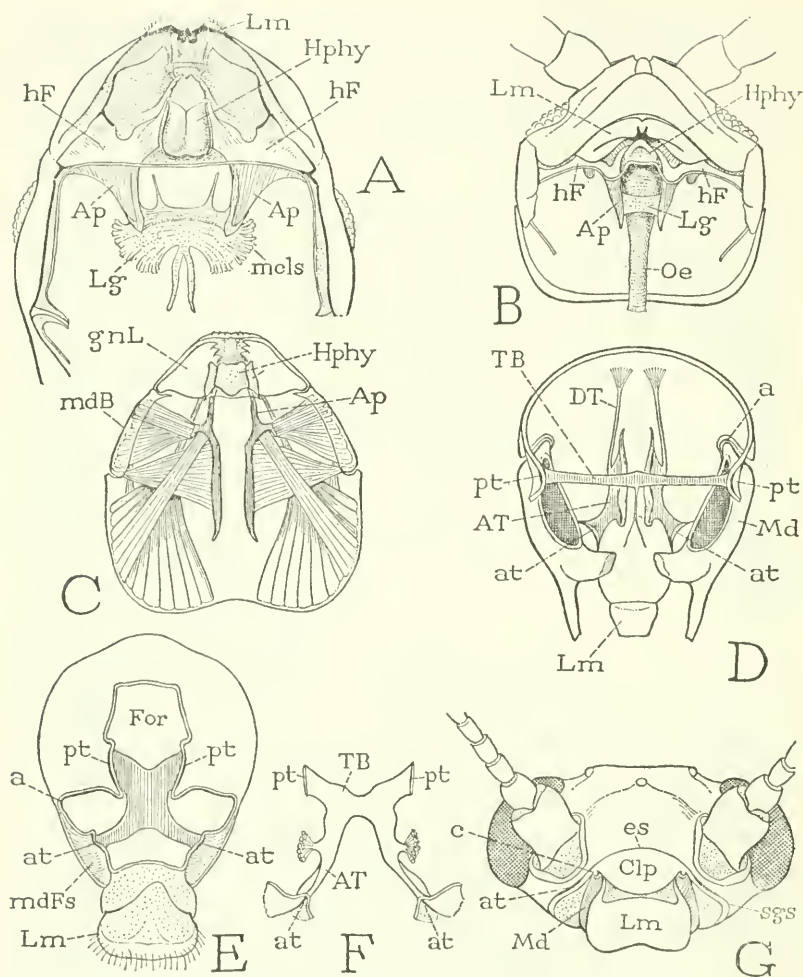


FIG. 16.—Evolution of the tentorium.

A, *Scutigera* sp., Chilopoda, ventral surface of anterior part of head with mouth parts removed, showing hypopharyngeal fulturae (hF) and their apodemes (Ap). B, *Lithobius* sp., Chilopoda, same view of head as A. C, *Scutigrella immaculata*, Symphyla, optical section of head behind mandibles. D, *Nesomachilis mauricus*, Thysanura, posterior view of interior of head, showing separate anterior tentorial arms (AT) and tentorial bridge (TB). E, *Isonychia* sp., Ephemeroptera, larval head, posterior, showing tentorium. F, *Anax junius*, Odonata, larval tentorium, dorsal. G, *Strophopteryx fasciatus*, Odonata, larval head, anterior.

central plate, which rests against the posterior bridge, or overlaps it, but does not unite with it. In both thysanuran families slender dorsal arms (D, DT) branch from the anterior arms and are attached on the cranial wall by small groups of muscle fibers.

From this primitive condition of the tentorium in Thysanura it is only a step to that in the Pterygota in which the anterior arms have become united with the posterior bridge (fig. 17 A). In an ephemerid larva (fig. 16 E) the anterior arms still arise on the ventral surface of the head, but in a lateral position from pits (*at*) just mesad of the mandibles, which lie in lateral fossae of the head wall (*mdFs*) but have no articulation on the clypeus. In Odonata, Plecoptera, Dermaptera, and some Orthoptera, however, the roots of the anterior

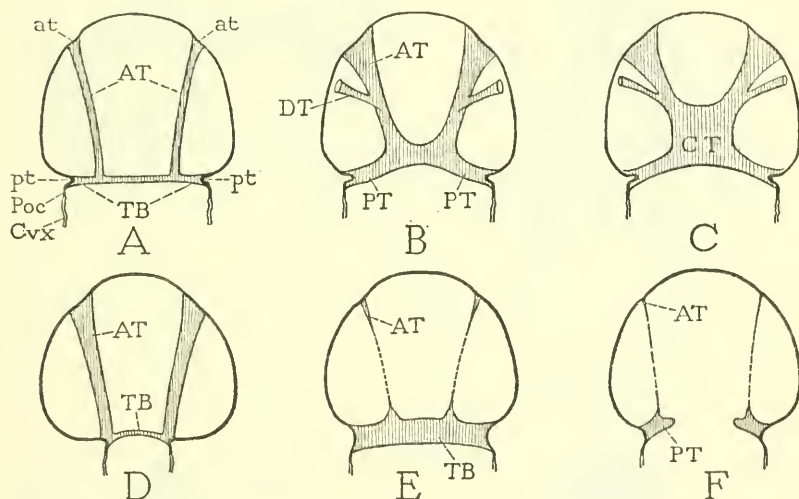


FIG. 17.—Variations of the pterygote tentorium, diagrammatic.

at, anterior tentorial pit; *AT*, anterior tentorial arm; *Cvx*, neck (cervix); *CT*, corpotentorium; *DT*, dorsal tentorial arm; *Poc*, postoccutiput; *pt*, posterior tentorial pit; *PT*, posterior tentorial arm; *TB*, tentorial bridge (united posterior arms).

arms (F, *AT*) are in the subgenal sulci *lateral* of the mandibles (G, *sgs*). Evidently the arms have been transposed to this position before the mandibles acquired their anterior articulations (*c*) on the clypeus. Finally in most higher insects these arms have taken a facial position on the head by migration into the epistomal sulcus, in which their pits are usually located (fig. 6 A, *at*). It may seem surprising that fixed structures should migrate in this apparent manner from a ventral to a lateral and finally to a facial position. It is hardly to be supposed, however, that the anterior tentorial arms, carrying always the same muscles, have been independently redeveloped in each of their several positions.

Once established as a unified composite structure (fig. 17 B), the pterygote tentorium undergoes numerous variations. In the orthop-

teroid and other lower insects with strong biting and chewing mandibles, the tentorium may be strengthened by the development of a central plate, the "corpotentorium," in which the four arms are united (C, *CT*). In the higher insects the tentorium retains more of the primitive form (A), but the relative thickness of the arms is variable. The anterior arms may form a pair of strong longitudi-

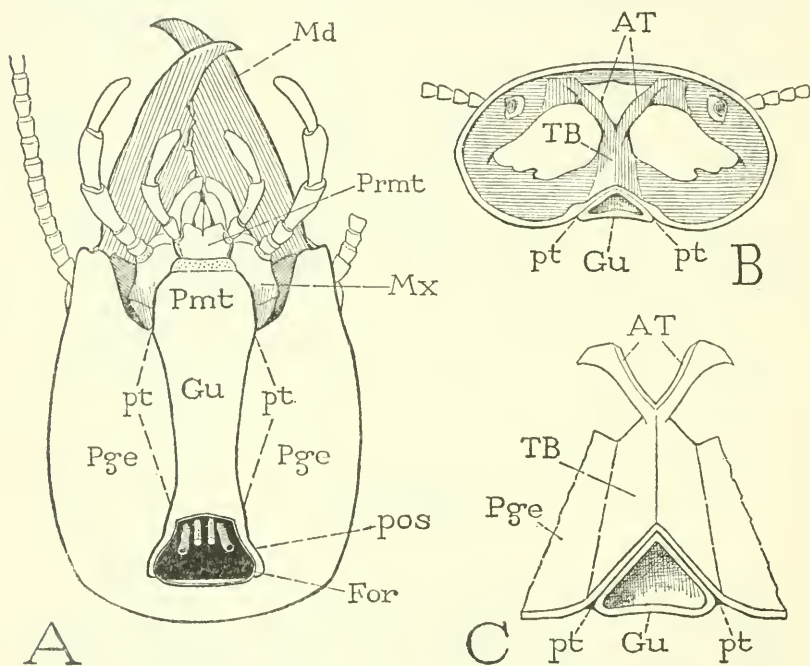


FIG. 18.—Head and tentorium of a soldier termite, *Termopsis* sp.

A, Undersurface of head, posterior tentorial pits (*pt*) greatly elongate. B, Cross section of head, posterior, showing tentorium in place. C, The tentorium, dorsal, tentorial bridge (*TB*) elongate.

nal bars through the head, connected by a narrow bridge (D), or the bridge may be strongly developed and the anterior arms reduced to mere threads (E). The bridge is nearly always retained in some form, but the component arms may be reduced to mere stubs giving attachment to very attenuated anterior arms (F). An unusual modification of the tentorium is seen in the soldier caste of a termite (fig. 18 B, C). The bridge (*TB*) is here drawn out longitudinally into a long, inverted trough, from the anterior end of which diverge the short anterior arms (*AT*). On the undersurface of the head (A) it is seen that the "pits" (*pt*) are long grooves at the sides of the gula.

The entognathous hexapods—Protura, Collembola, and Diplura—have no head structure corresponding anatomically with the tentorium of the ectognathous insects. When the cleared head of one of these forms is examined by transmitted light there is seen a pair of long skeletal arms (fig. 19 B, S) extending posteriorly from the hypo-

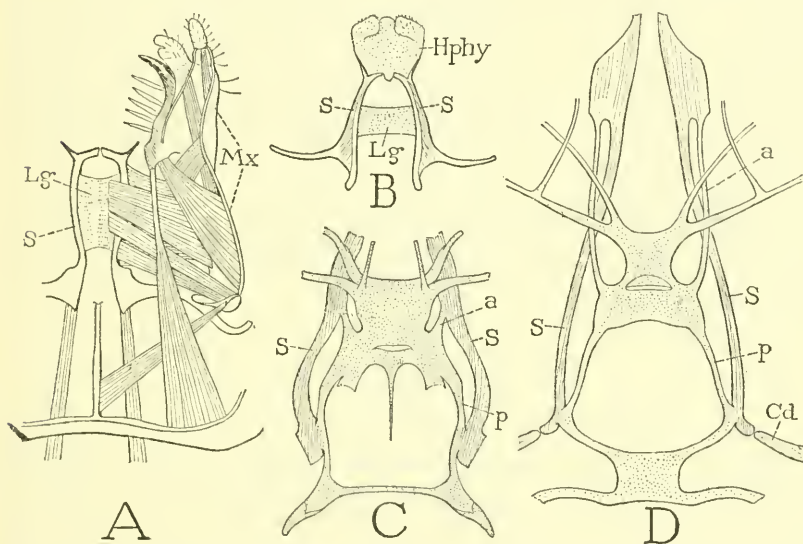


FIG. 19.—Noncuticular endosternal structures in the head of Diplura and Collembola.

A, *Heterojapyx gallardi*, Diplura, sternal arms of head (S) connected by internal arched ligament (Lg), giving attachment to maxillary muscles, dorsal. B, *Campodea* sp., Diplura, hypopharynx and sternal arms with internal ligamentous bridge, dorsal. C, *Onychiurus fimentarius*, Collembola, sternal arms of head and endosternal superstructure with supports (a, p) on sternal arms (adapted from Denis, 1928). D, *Anurida maritima*, Collembola, same parts as at C (from Denis, 1928).

pharynx. These arms have been mistaken for tentorial apodemes, but actually they are sternal arms contained in the walls of the gnathal pouches, as shown by the writer (1951) and by Tuxen (1952). Folsom (1900) described their superficial origin in the embryo of Collembola. The sclerites clearly pertain to the maxillary segment since the cardines are articulated on their posterior ends (D, Cd).

In the Diplura (fig. 19 A, B) an internal membranous bridge (Lg) is arched upward between the sternal arms and gives attachment to ventral muscles of the maxillae (A). In the Collembola an elaborate superstructure is built upon the sternal arms (C, D), consisting of

transverse anterior and posterior parts variously developed in different species and supported by props (*a*, *p*) on the sternal arms. This structure has been fully described by Denis (1928), who called it a "tentorium." However, it has no resemblance to either the thysanuran or the pterygote tentorium, and moreover, as shown by Tuxen (1952), it is a mesodermal tissue soluble in caustics and lactic acid. This collembolan "tentorium" is thus more nearly comparable to the endosternum of Chelicerata. Since it gives attachment to the ventral muscles of the mouth parts, it functionally serves the same purpose as the chelicerate endosternum and the tentorium of the ectognathous insects. In Protura there is no corresponding superstructure on the maxillary sternal arms.

Incidentally it may be observed that, in the possession of a cuticular tentorium, the ectognathous hexapods appear to be more closely related to the chilopods and symphylans than to the entognathous hexapods.

VII. THEORETICAL CONSIDERATIONS

The accumulation of knowledge does more than simply add new facts to old ones; it changes our ideas about the accepted facts. This is particularly true in our study of insect anatomy and our morphological interpretation of the structural facts. We have now become involved in interpretations and theories that never occurred to the earlier entomologists, and hence they could write their descriptions of insect anatomy in a more direct and simple manner than we can. Furthermore, since morphology (the science of form) is a product of our brains, and our brains are not standardized, we are now perplexed with opposing theories that purport to explain the same set of facts in different ways. Our descriptive matter, therefore, has become so mixed with argumentation that the facts often seem less important than the theoretical discussions about them. In particular, some modern theories of insect head segmentation are so opposed to all our former ideas as to make the insect head seem so complex that it is hard to visualize how it ever got that way in its evolution. Even the embryo appears to be unable to recapitulate its evolution according to these theories, and adheres to old-fashioned ways of development. Of course, it is always possible that theories do not represent the truth. So in this study of the insect head we must critically re-examine not only the evidence, but also inductions made even from correctly observed facts.

The following discussions will be concerned with theoretical ques-

tions concerning the nature of the labrum, segmentation of the embryonic head lobe, and the homology of the antennae with trunk limbs.

THE LABRUM

The writer formerly expressed the opinion that the labrum is the anatomical anterior pole of the arthropod and that its ventral position in some cases is secondary. Dahl (1956), however, has vigorously opposed this view as turning "the available evidence upside-down." On the other hand, Young (1959) reasserts that "the labrum is the anterior end of the arthropod." It is true, of course, that the labrum is formed on the underside of the embryonic head lobe, but in a variable position, and the fact remains that the anteriormost nerve endings are on the labrum regardless of its position.

Since the labrum in so many cases is developed from a pair of lobes that unite, and in the adult insect is often emarginate medially, some writers have expressed the opinion that the labrum represents a pair of appendages. The insect labrum is consistently provided with two pairs of antagonistic extrinsic muscles from the frons, and usually with internal compressor muscles. Judging from the anatomical literature on the arthropods it would appear that musculature of the labrum is exceptional. In the shrimp *Penaeus setiferus*, however, Young (1959) finds a highly complex labral musculature including 12 bilateral pairs of intrinsic muscles running in all directions through the labrum, and two pairs of extrinsic muscles inserted on its base. Because of its inconsistency the labral musculature gives no clue to the nature of the labrum, but the labral innervation has been invoked by several writers as evidence that the labrum is not the simple lobe of the head it appears to be. The labrum is said to be innervated from the postoral tritocerebral ganglia of the brain, but this fact has led to two quite different theories as to the morphological status of the labrum. (As will be shown, the nerves in question really go from the labrum to the tritocerebral ganglia.)

One interpretation of the labrum, the Ferris-Henry theory, is correlated with a comparative study of the annulate nervous system by Miss Henry (1948). She starts with the assumed principle that nerves are always confined to the segment of their ganglionic origin. Then she logically contends that, since the labrum is innervated from the tritocerebral ganglia, it must be the segment of these ganglia, and is therefore the *first segment* of the arthropod head, equivalent to the prostomium of the earthworm. Though in no modern arthropod,

embryonic or adult, do the tritocerebral ganglia lie in the labrum, ganglia themselves are free to move, and hence, according to Henry, the tritocerebral ganglia have been displaced posteriorly and have united with the back of the brain in the adult insect. The tritocerebral segment is commonly said to be the segment of the second antennae in the Crustacea. Henry, however, after establishing the labrum as the tritocerebral segment, asserts that this cannot be true, because, as she correctly observes, "these antennae do not occur on the labrum."

All this interpretation is so at variance with well-known and long-described facts of arthropod embryogeny and comparative anatomy that it creates a suspicion there is something wrong about it. It appears to be supported on a conviction (Henry, 1947) that the arthropods have been evolved from polychaete annelids, and that the eversible proboscis of these worms is the introverted first two trunk segments. Consequently the mouth of the polychaete is said to be apical on the first segment, and this segment becomes the labrum in the arthropods. (And yet, certainly no arthropod has its mouth on the end of the labrum.)

In conformity with her claim that the polychaete proboscis consists of the first two segments introverted, Henry relegates the polychaete prostomium to the "third segment," and denies its homology with the oligochaete prostomium. This, to say the least, creates a curious discrepancy between these two groups of annelids. Since it is assumed that the arthropods have been derived from the Polychaeta, the corollary follows that in the arthropods the oculo-antennal part of the head must be the third segment. Henry's evidence for the segmental nature of the polychaete proboscis has been critically examined by DuPorte (1958), who reports that it is inconclusive. The account by Wells (1954) of the structure and mechanism of the proboscis of *Arenicola* certainly gives no suggestion that the proboscis is anything other than an eversible anterior part of the alimentary canal.

A very different concept concerning the nature of the labrum is proposed by Butt (1957). From his own embryological work and that of others he has assembled evidence that in many insects of several orders the labrum is formed from a pair of small lateral lobes that come together and fuse before the mouth. Eastham (1930) says there is no doubt of the bifid nature of the labrum as it first appears in the embryo of *Pieris rapae*, each half of the organ being a hollow extension of the head wall containing preoral mesoderm. According to Mellanby (1936), the labrum of *Rhodnius* appears definitely to arise as a paired structure, and it is observed by Ando and Okada

(1958) that in the sawflies *Aglaostigma* and *Pteronidea* "the labrum first appears as a pair of elevations which later become united on the median line." In *Pteronidea ribesii* Shafiq (1954) says the labral lobes unite at the 28th hour of embryonic life, and the stomodaeum develops immediately behind them. Further evidence of the double origin of the labrum is claimed by Bervoets (1913) to be seen in the individual tracheation of the halves of the labrum observed in an odonate larva.

It may be conceded, then, that at least in many insects the labrum is formed from paired rudiments, and there is evidence of its similar origin in some other arthropods. The innervation of the insect labrum by nerves from the tritocerebral brain ganglia, which led Henry (1948) to conclude that the labrum is the *segment* of these ganglia, is interpreted by Butt (1957) as evidence that the paired labral rudiments are the *appendages* of the tritocerebral segment, which have moved forward to a preoral position and united with each other. Minute tritocerebral appendages have been observed in the embryo of a number of insects, but in most cases they are described as transient vestiges.

In the Crustacea the premandibular, or "tritocerebral," appendages develop into the large second antennae. Butt suggests, therefore, that it is logical to assume that the crustacean labrum represents the fused basal parts of the second antennae. Yet, in the adult crustacean the second antennae, though they have migrated forward, are usually widely separated from the labrum, and show no evidence of having given up their basal parts to form the labrum, which should have involved the loss of their basal muscles. In the lower branchiopods the second antennal nerves are given off from the brain connectives near the premandibular ganglia; in the decapods they arise from the back of the brain. The labral innervation is entirely independent of the second antennal nerves. Finally, in the early crustacean embryo (fig. 1 E) or the nauplius larva a labrum is generally recognized already present before the mouth while the second antennae are still behind the first antennae. In the amphipod *Gammarus*, Weygoldt (1958) illustrates the embryonic head region (F) with a well-developed, bilobed labrum overhanging the mouth while the second antennal lobes are yet far behind the mouth. In the Crustacea, then, there is clearly no relation of the labrum to the second antennae. Since the labrum is evidently a homologous structure in all the arthropods, its rudiments in the insects can hardly be identified with the crustacean second antennae, or the appendages of the tritocerebral segment.

Since the basic point in the arguments of both Henry and Butt concerning the nature of the labrum is the "innervation" of the insect labrum by nerves from the tritocerebral ganglia, the value of these nerves as evidence must now be examined. In the insects a nerve trunk goes forward from each tritocerebral lobe of the brain and divides into a frontal-ganglion connective and a so-called "labral" nerve. The latter nerve, however, does not restrict its branches to the labrum; it ramifies profusely to the epidermis of the frons, the clypeus, the labrum, the mouth region and the epipharynx. If Henry (1948), therefore, had taken into account the entire head area of the insect supplied by the "labral" nerves, she should have included at least the clypeus as well as the labrum in her "first segment," whereas the clypeus is regarded as the "second segment." Chaudonneret (1950) is more consistent in this respect, since he attributes the median parts of both the labrum and the clypeus to the tritocerebral segment, the lateral parts to a "superlingual" segment. However, he regards the clypeolabral area as being only the sterna of these segments which have become preoral. Likewise invalidated by the wide distribution of the "labral" nerves is the contention of Butt (1957) that the tritocerebral innervation of the labrum identifies the labral lobes with the tritocerebral appendages. Clearly the labral branches of these nerves can have no specific value of any kind related to the labrum alone.

Furthermore, the tritocerebral nerves which are said to "innervate" the fore part of the head have been shown to be integumentary sensory nerves. Bretschneider (1914) says those of the cockroach *Periplaneta* (*Blatta*) are entirely sensory. Jösting (1942) illustrates their elaborate sensory ramifications on the clypeus and labrum of the larva of *Tenebrio*. According to Bierbrodt (1942) these nerves in the larva of *Panorpa* come from the epidermal sense organs of the frons, the clypeus, the labrum, and the mouth region. In the mallophagan *Myrsidea* the "labral" nerves are described by Buckup (1959) as breaking up into sensory branches to the labrum, the clypeal region, the cibarial sclerite, and the epipharynx.

While it may be true that motor nerves commonly are restricted to the segments of their respective ganglia, this is not necessarily true of integumental sensory nerves. The neurocytes of sensory nerves are peripheral, their axons grow inward to the ganglia. It has been shown by Wigglesworth (1953, 1959) that as new sense cells are developed in the epidermis of postembryonic instars of *Rhodnius*, their axons grow inward, join with the first nerves they meet, and accompany them to the central nervous system. The clypeolabral

nerves originate in sense cells of the epidermis and enter the tritocerebral ganglia usually by way of the frontal-ganglion connectives. In the Mallophaga, however, Buckup (1959) shows that they enter the ganglia independently.

Dorsal tegumentary nerves from the tritocerebrum of insects undoubtedly go to segmental regions of the head that are not tritocerebral, since this segment is practically eliminated in the adult head. In the malacostracan Crustacea, according to Hanström (1928), a dorsal tegumentary nerve from the brain branches anteriorly to the eye stalks and posteriorly to the whole cephalothorax. In *Limulus* Patten and Redenbaugh (1899) describe and illustrate a pair of lateral nerves from the tritocerebral ganglia that turn backward on the epidermis of the leg segments and finally branch toward the first five appendages of the abdomen.

Tegumentary sensory nerves, therefore, do not necessarily identify segments or segmental appendages by the ganglion they enter. The neurocytes of motor nerves, on the other hand, lie in the ganglia and in general their function is to innervate the muscles of the corresponding body segments. Motor nerves are thereby more reliable indices of segmental limits than are sensory nerves, but even here there may be exceptions. Nüesch (1954) reports that in the thorax of the moth *Telea polyphemus* the second ganglion gives off nerves to the three thoracic segments. The deductions of both Henry and Butt are thus not justified, since both are based on the sensory nerves of the labrum, which are merely a group of sensory fibers from the general preoral region of the head. Only in the tritocerebral ganglia can these fibers make connections with motor neurons of the ventral nerve cord. The function of sensory stimuli is to produce movement.

Of greater significance than the sensory innervation of the foreparts of the head is the fact that the motor innervation of the labral and clypeal muscles comes from the frontal ganglion, or its equivalent in some arthropods known as the stomodaeal bridge. Chaudonneret (1950), for example, describes in *Thermobia domestica* an elaborate innervation of the anterior head region from the frontal ganglion. Dorsal nerves of the ganglion go to the muscles of the mouth angles (hypopharyngeal muscles) and to the anterior dilators of the pharynx. A median nerve goes to the labral muscles, and lateral nerves go to the cibarial dilators (clypeal muscles) and the transverse epipharyngeal muscles.

The frontal ganglion is developed from the anterior wall of the stomodaeum just before the mouth. The stomodaeum, however, is an ectodermal ingrowth at the site of the mouth. The frontal gan-

gion, therefore, is actually a preoral first ganglion of the ventral nerve cord, as becomes evident if the tritocerebral ganglia are imagined to be restored to their primitive ventral postoral position (fig. 20). In the symphylian *Hanseniella* the frontal ganglion is shown by Tiegs (1940) to be represented by a pair of ganglia connected by a preoral commissure. Nerves go to the clypeolabrum from the ganglia, and the stomodaeal recurrent nerve arises from the commissure.

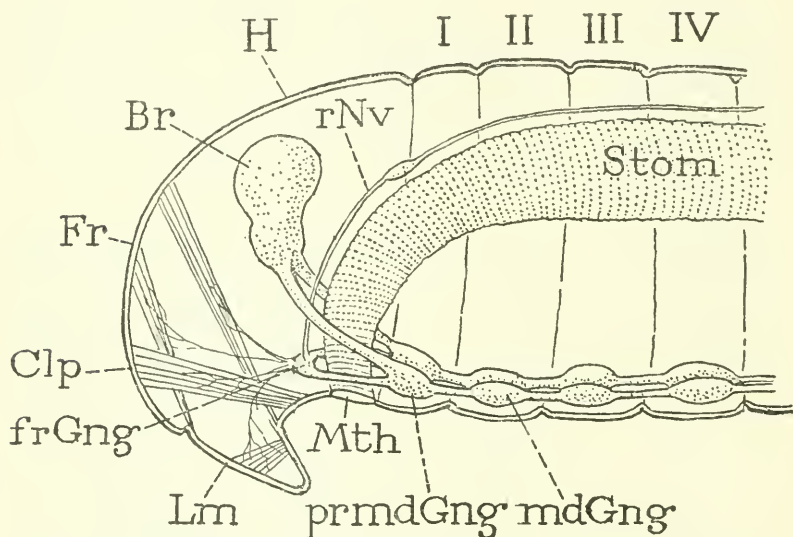


FIG. 20.—Diagrammatic theoretical reconstruction of the anterior region of a primitive arthropod before the postoral segments (I-IV) became a part of the head. The premandibular ganglia (future tritocerebral ganglia) are still ventral behind the mouth. The preoral frontal ganglion (*frGng*) is seen to be the first ganglion of the ventral nerve cord, innervating the clypeal and labral muscles, and the ectodermal stomodaeum.

The connection of the preoral frontal ganglion with the premandibular tritocerebral ganglia is of no more significance than the connection of these ganglia with the mandibular ganglia or the union of any other consecutive ganglia in the ventral nerve cord. As described by Orlov (1924) in the larva of *Oryctes nasicornis* the frontal ganglion is in itself a fully developed nerve center containing sensory, motor, and association neurons. The preoral ocular and antennal brain centers are primitively supraoesophageal ganglia connected with the ventral nervous system by way of the postoral tritocerebral ganglia.

Considering the difficulties encountered by theories that attempt

to identify the labrum with the tritocerebral segment or with its appendages, it seems much simpler to accept the labrum for what it appears to be in all the arthropods from trilobites to insects, namely, a preoral lobe of the head. When it is formed by the union of a pair of lobes it practically refutes the idea that it is a head segment, and a forward migration of the tritocerebral appendages that unite before the mouth is hard to visualize as a logical event in evolution. The frequent double origin of the labrum and its dual musculature in insects might suggest that the labrum represents a pair of united appendages; but the vision of a primitive arthropod having a pair of ventral appendages in front of its mouth is too fanciful to be real. Functionally the labrum is a preoral lip, which may have first served to arrest food at the site of the mouth when pushed forward by the postoral appendages.

THE EMBRYONIC HEAD LOBE

The nature of the cephalic lobe of the arthropod embryo, whether or not it is composed of consolidated primitive segments, and if so, of how many segments, has been the subject of endless discussions, arguments and counterarguments, and still the question cannot be considered as definitely answered. Our only source of evidence is the embryo itself. The embryo shows us visible facts, but it does not interpret them in phylogenetic terms, nor does the embryo give us any assurance that it fully recapitulates its ancestral history, which is the very thing we want to know. Hence, whatever phylogenetic interpretations we may deduce from embryogeny are products of our own mental processes, and differ according to our different ways of thinking. Since evolutionary theories cannot be put to an experimental test, and we cannot see backward in time, arguments continue because we are ever prone to make the known facts fit a favored theory.

The principal, externally visible facts about the embryonic head lobe are that it projects anterior to the mouth, shows no clear outward sign of segmentation, and bears the first antennae, the labrum, and the eyes when the eyes are developed. A pair of small lobes lying before the antennae, observed in a centipede (Heymons, 1901) and an orthopteroid insect (Wiesmann, 1926), have been regarded as vestiges of preantennal appendages. It is therefore contended that the head lobe includes at least a preantennal segment and an antennal segment, and some would include an ocular segment. If there is any remote ancestral relation between the arthropods and the annelid

worms, the cephalic lobe of the arthropod embryo should contain some part derived from the nonsegmental prostomium of the worms. Heymons (1901) in his study of the embryo of a centipede, *Scolopendra*, asserts that only the clypeal region and the labrum pertain to the prostomium, and that the first three postoral segments of the annelid are represented in the arthropod by an ocular segment, a preantennal segment, and an antennal segment. These alleged segments, he says, correspond with internal nerve ganglia and with mesodermal coelomic sacs.

Small paired cavities in the preantennal mesoderm have been observed in a number of arthropods, and there are usually mesodermal sacs associated with the antennae. In several cases, also, cavities have been reported in the labral mesoderm, but none has been attributed to the ocular region. Weber (1952), after a review of the various theories of head segmentation, gives his own conclusions as follows. The arthropod head consists of a prostomial acron and six segments. The acron contains the primitive brain, or archicerebrum, which innervates the eyes. Its ventral part becomes elongate posteriorly to the mouth. A *preantennal segment* follows the acron. Its ganglia, termed the prosocerebrum, unite with the archicerebrum to form the definitive protocerebrum. The preantennal coelomic sacs are often suppressed or united with the second pair. Next is the *antennal segment*, the ganglia of which become the deutocerebral component of the brain. Third is the *premandibular segment*. Its ganglia in lower Crustacea remain on the circumoesophageal connectives, but in the other groups they unite with the brain as the tritocerebrum. These are the ganglia of the second antennae of Crustacea, of the chelicerae in the Chelicerata. The fourth, fifth, and sixth segments are the mandibular, first maxillary, and second maxillary, or labial, respectively.

Weygoldt (1958) in his study of the embryonic development of the amphipod *Gammarus* arrives at essentially the same analysis of the head segmentation as does Weber. This interpretation, that the head consists of a prostomium and six segments, is probably agreeable to most students of the subject who contend that the embryonic head lobe is a formerly segmented region of the trunk. Dahl (1956), for example, says that Weber's interpretation is the one that most closely agrees with his own view on the matter.

A somewhat different scheme of head segmentation is deduced by Chaudonneret (1950) from his elaborate study of the head of *Thermobia domestica*. The prostomium he restricts to a very small apical

region before the first segment. The latter Chaudonneret calls the "preantennular" segment, the ganglia of which become the protocerebrum, and the appendages the eye stalks of Crustacea. The second segment is that of the first antennae, the third is the second antennal segment, the ganglia of which become the tritocerebrum. The fourth segment is the segment of the superlinguae, the next three those of the mandibles, maxillae, and labium. Chaudonneret thus, by reviving the long discredited superlingual segment and omitting the preantennal segment of other writers, makes out seven segments in the adult head.

On the other hand, from a comparative study of the internal organization of the brain in the Polychaeta, Onychophora, and Arthropoda, Holmgren (1916) and Hanström (1928) have very reasonably argued that the entire preoral head lobe of the arthropod embryo represents the annelid prostomium. First it is to be noted that both the prostomium of the worm and the head lobe of the arthropod are preoral, and show no external evidence of segmentation. Second, the part of the arthropod brain formed inside the cephalic lobe shows a striking resemblance to the prostomial archicerebrum of the polychaetes.

The brain of the Polychaeta innervates the anterior tentacles, the eyes, and the prostomial appendages known as the palps. The brain centers of the palpal nerves lie behind the optic centers and are closely associated with the corpora pedunculata. In some families the ganglia of the first postoral segment, from which arises the stomatogastric system, are united with the brain.

The brain of Onychophora consists of the primitive prostomial brain and the secondarily added first postoral ganglia. The tentacles of the annelids are absent in the Onychophora, but the forebrain innervates the eyes and the antennae. The antennal commissure lies behind the optic centers and the antennal nerve centers are associated with the corpora pedunculata just as are the palpal centers in the polychaete. The onychophoran antennae thus would appear to represent the polychaete palpi. The onychophoran brain, as that of the arthropods, contains a central body. The hind brain innervates the feeding organs known as the "jaws," which thus correspond with the chelicerae or second antennae of the arthropods. It gives origin to the stomatogastric nerves, and its component ganglia are connected by a suboesophageal commissure.

The internal structure of the arthropod brain closely resembles that of the onychophoran brain, except that the ocular and antennal

centers are more differentiated. It is argued, therefore, by the above-named authors that the oculo-antennal part of the arthropod brain represents the prostomial brain, or archicerebrum, of the polychaetes, and that the procephalic part of the adult head is derived from the annelid prostomium. Secondly added to the brain in the insects and myriapods are the ganglia of the first postoral body segment, which become the tritocerebral brain lobes. The commissures of the optic and antennal centers are intracerebral and suprastomodaeal. The commissure of the tritocerebral ganglia is free beneath the stomodaeum.

This concept that the adult head consists of a primitive cephalic lobe equivalent to the prostomium of the annelids and four secondarily added postoral somites has been maintained in a recent study by Butt (1960) on the embryonic development of the arthropod head. The prostomial part of the head is represented in the embryo by the blastocephalon, within which are differentiated from the archicerebrum the ocular and antennal centers of the definitive brain.

The principal objection that has been urged against this interpretation is based on the occurrence of paired cavities in the mesoderm of the embryonic cephalic lobe. The presence of mesodermal cavities, regarded as coelomic sacs, has been recorded in the labrum, in the preantennal region, and associated with the first antennae. Most writers discount the significance, or even the verity, of the labral cavities, but the preantennal and antennal sacs are taken as evidence of segmentation. The preoral mesoderm has been shown in Onychophora and Arthropoda to be formed by forward growth of postoral mesoderms, the labral mesoderm being derived from the preantennal mesoderm. This fact cannot mean necessarily that the forward-growing mesoderm represents anteriorly migrating segments, and it throws some doubt on the segmental value of the transient cavities that subsequently appear in it.

The mere presence of paired cavities in the trunk mesoderm is accepted by some zoologists, especially embryologists, as unquestioned evidence of body segmentation. If, then, any pair of cavities in the mesoderm, particularly when associated with nerve ganglia, defines a segment, there is no further argument on the subject. However, in the adult animal a segment is a motor unit of the body with an intrasegmental somatic musculature. In this sense, therefore, the contention that the blastocephalon is a segmented region implies the assumption that at some time in the history of the insect it consisted of individually movable rings. Clearly this assumption is purely

theoretical in the absence of concrete evidence, and it is difficult to visualize the embryonic head as having once consisted of individually movable segments. It is easier to believe that temporary cavities can occur in the preoral mesoderm without giving rise to segments. Primitive coelomic cavities must have had some primary reason for their formation, probably a physiological one. They usually set the pattern for segmentation, but that they necessarily form segments is just a convenient belief for supporting a theory when no segmentation is visible. DuPorte (1957) has well discussed the weakness of evidence for segmentation in the preoral head region derived from the presence of cavities in the mesoderm.

It is true that Nelson (1915) describes protocerebral and deutocerebral segments in the embryo of the honey bee, but it appears that he refers to surface swellings over the ganglia; no mention is made of coelomic cavities in this region. Shafiq (1954) likewise finds no coelomic sacs in the embryonic head of the sawfly *Pteronidea ribesii*, and from the lack of any other evidence of segmentation he concludes that the embryonic head is better interpreted as an unsegmented acronal lobe bearing the eyes, the antennae, and the labrum.

The occurrence of cavities in the labral mesoderm should be somewhat embarrassing to the segmental theory regarding the rest of the head lobe. Most embryologists do not accept the labrum as a segment, but they insist that the cavities in the following region denote former segments. Yet the presence of paired mesodermal cavities in the labrum appears to be as well attested as that of cavities in the preantennal and antennal mesoderm. Paired cavities in the embryonic labral mesoderm have been described by Wiesmann (1926) in *Carausius*, by Mellanby (1936) in *Rhodnius*, by Roonwal (1937) in *Locusta*, by Eastham (1930) in *Pieris*, and by Miller (1940) in *Pteronarcys*. The cavities, however, soon become disorganized and their walls reduced to irregular cell masses. That the labrum contains mesoderm in all cases is unquestioned, but the validity of the labral cavities as true coelomic sacs is disputed by some writers, particularly by Manton (1928), who cites Wiesmann as the only one who records the presence of labral sacs distinct from a pair of preantennal sacs. More recently, however, Miller (1940) has described in the stonefly *Pteronarcys* definite traces of cavities in the preantennal mesoderm, as well as cavities in the labral mesoderm.

To further support the claim of primary segmentation in the blastocephalon, it will be argued that the presence of ganglia is in itself evidence of segmentation. It is true, of course, that each pair of

ganglia in the trunk pertains to a segment. A trunk segment, however, is determined by the somatic muscles, and the ganglia are necessary to activate the muscles. In the blastocephalon, or the part of the adult head derived from it, there are no somatic muscles. This head region bears the eyes and antennae, and sense organs do not form segments as do muscles; but they also must have nerve centers. Thus the claim that nerve ganglia define segments is not valid, except theoretically, where there is no muscular segmentation.

The preoral and intracerebral position of the ocular and antennal brain commissures appears to conflict with the claim that the ocular and antennal ganglia belong to segments that were formerly postoral. It is explained, however, that these commissures are formed *after* the cephalization of the ganglia. Yet these ganglia, in common with the other body ganglia, should have had free ventral commissures before they were cephalized. If the cephalic lobe of the embryo is a segmented region, it should have ventral ganglia corresponding with its component segments, but the only ventral ganglion of this region is the preoral frontal ganglion, which innervates the clypeal and labral muscles and the ingrowth of the oral ectoderm that forms the stomodaeum. This fact in itself should suggest that the embryonic head lobe is a preoral anatomical unit. The connection of the frontal ganglion with the tritocerebral ganglia does not make this ganglion a tritocerebral element, since its circumoral connectives with the tritocerebral ganglia are equivalent to the connectives between any two consecutive ganglia of the ventral nerve cord.

Most of the theories of arthropod origins are based on the assumption that the arthropods have been derived from polychaete worms. Glaessner (1958) has described a fossil polychaete from the base of the Cambrian, but the arthropods must have originated a long time back in the Precambrian. It, therefore, does not follow that polychaetes were yet in existence at the time when the arthropod progenitors became differentiated from simple ancestral segmented worms. What the arthropods and onychophorans may have in common with modern annelids, therefore, must be traced back to some primitive common wormlike ancestor, which very probably was not a polychaete or even a chaetopod.

Until some embryo or some arthropod living or fossil is found with a preoral segmentation, we have no real evidence that this part of the animal ever was segmented. Theorists who put their faith in a few small cavities in the preoral mesoderm have yet to prove that these cavities ever belonged to true body segments. Since we shall

probably have to wait a long time for this proof to materialize, we may as well in the meantime be content with the facts as they are known. If we must have a theory, that of the prostomial nature of the embryonic blastocephalon is the simplest and the easiest to visualize. However, even if we do not know the facts concerning the segmentation of the head, and perhaps never shall know them, ignorance in this respect will have no practical effect on an understanding of the head structure in modern arthropods. And really, it would be too bad if the question of head segmentation ever should be finally settled; it has been for so long such fertile ground for theorizing that arthropodists would miss it as a field for mental exercise.

THE ANTENNAE

The principal theoretical question pertaining to the antennae (antennules of Crustacea) concerns their possible homology with other appendages. The nature of the antennae then has an important bearing on the question of segmentation in the embryonic blastocephalon.

That the antennae are not organs equivalent to the postoral appendages would seem obvious from the fact that normally they never have a leg structure in any arthropod, and are filamentous even in the trilobites. The antennules of Crustacea may be branched, but not in the manner of the second antennae or other truly biramous appendages. Furthermore, the antennal nerve centers are always closely associated in the brain with the ocular centers, and are connected by a preoral, intracerebral commissure. The only brain ganglia that are known to have a postoral origin are those that become the tritocerebral lobes of the brain. From the likeness of the first antennal nerve centers in the arthropod brain to the nerve centers of the palps in the polychaete brain it has been contended that the antennae are homologues of the annelid palps. The antennae are palplike in their embryonic origin, but since the derivation of arthropods from polychaetes is an overworked theory, the palps and antennae may be quite separate organs in their origin.

In opposition to the idea that the first antennae are primary preoral appendages of the embryonic head lobe, there is often cited the well-known fact that the insect antennae when amputated at or near the base are frequently regenerated in a form having a striking resemblance to a segmented leg with a pair of apical claws (fig. 21 D). The same results have been obtained by other methods, and leglike antennae are sometimes found in nature.

Bodenstein and Abdel-Malek (1949) submerged larvae of *Dro-*

sophila virilis in a nitrogen mustard solution for 30 minutes, then washed and dried them. Many of the emerged adults showed malformations of the antennal arista and the compound eyes, as well as of other parts of the head and body. The antennae and the eyes of muscoid flies are developed in deep pouches of the head wall (not from the "pharyngeal cavity" as the above authors state. (See Snodgrass, 1953).

The effects of the treatment on the antennae varied from an arista almost normal (fig. 21 F) except for the presence of two points on the apex, through a series of greater modifications (G), to one that somewhat resembled a jointed, two-clawed leg (H). The results varied with the age of the larvae treated, being greatest between ages of 70 to 78 hours. After 88 hours the antennae regenerated normally.

The normal antenna of *Drosophila virilis* (fig. 21 E) consists of the usual parts of a typical muscoid antenna, namely, a narrow basal scape (*Scp*), a pedicel (*Pdc*), and a large lobe (*Ifl*) bearing an arista (*Ar*). The arista and the supporting lobe together constitute a four-part flagellum, the arista having a very narrow basal ring, a small second unit, and a long, branched apical shaft. It is of particular interest to note that in the regenerated appendage (G, H) it is only the arista that assumes the leglike character. Hence the term *aristapedia* given by Bodenstein and Abdel-Malek to these regenerated antennae.

Lengerken (1933) describes leglike antennae of a beetle, *Tachyderes succinctus*, found in nature. The normal antenna of this species (fig. 21 A) has a large, somewhat swollen scape, a small pedicel, and a long, slender flagellum of 10 subsegments. In the abnormal antennae (B, C) the scape, pedicel, and first section of the flagellum are approximately normal, but the rest of the flagellum is an irregular, apparently 7-segmented structure with a pair of terminal claws. As in *Drosophila* the deformity affects only the flagellum beyond its basal section (*Ifl*), the proximal part of the appendage being that of a normal antenna. The resulting *Fühlerbein*, Lengerken observes, could have no locomotor function.

Perhaps the most leglike regenerates from amputated antennae are those obtained from experiments on Phasimidae. Cuénot (1921), working with *Carausius (Dixippus) morosus*, amputated the antennae through the middle of the scape or pedicel and obtained regenerates (fig. 21 D) with a typical leg tibia, a tarsus of four tarsomeres, and two apical claws with a median lobe between them. Even here, however, there is not a complete leg, and the large regenerated basal

segment is that of the antenna. Friza and Przibram (1933), from amputation experiments on *Sphodromantis* and *Drosophila*, report that the regenerated pedicel always contains an organ of Johnston,

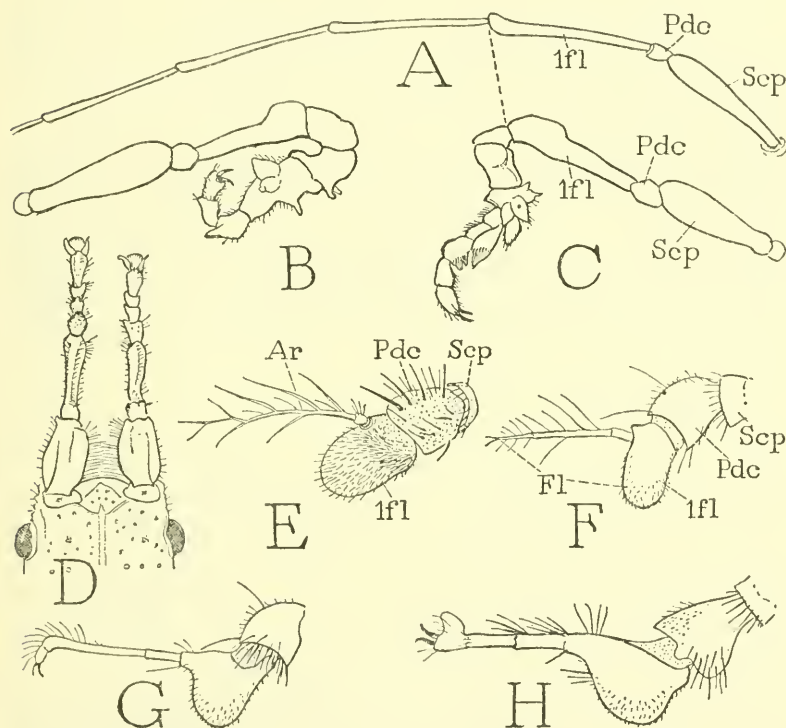


FIG. 21.—Examples of normal and leglike antennae. (A, B, C, from Lengerken, 1933; D, from Cuénot, 1921; F-H, from Bodenstein and Abdel-Malek, 1949).

A, *Trachyderes succinctus*, Coleoptera, normal antenna. B, C, Same, left and right leglike antennae found in nature. D, *Carausius morosus*, Orthoptera, adult antennal regenerates after section through middle of second segment. E, *Drosophila virilis*, Diptera, normal antenna. F-H, Same, antennae of adults reared from larvae treated with nitrogen mustard, showing various degrees of leglike regeneration.

and that the usual muscles are present in the scape. Here again, therefore, it is only the flagellum that undergoes malformation during regeneration, and the new appendage never reproduces the complete segmentation of a leg. In some insects no regeneration follows complete amputation of an antenna, as reported by Gäbler (1934) in his study of Homoptera.

It is the common presence of apical "claws" on the regenerated

antennae that gives the latter their most leglike appearance. Lengerken (1933) suggests that the apparent claws result from a splitting of the end of the flagellum. Similar processes, he says, are often found on the apex of the normal antenna, and he gives a figure of such an antenna in a beetle. Though the frequent occurrence of claws on regenerated antennae is somewhat perplexing, before we accept them as true pretarsal leg claws we should know more of their structure, and of how they arise from the end of the appendage.

Those who discount the idea that the regenerated antenna is a reversion to a primitive leg, usually explain its leglike form as resulting from the influence of the "leg organizer" on the newly growing tissue. It is surprising, then, that the basal part of the regenerate should always be that of an antenna. The various forms of normal antennae (fig. 14) are produced principally by modifications of the flagellum. As already noted, the flagellum of the lower insects grows by subdivision of its basal section.

It is quite impossible that the insect antenna was ever a leg in the past history of the *insects*. The Crustacea are older than the insects, and none of them has a leglike first antenna; even in the trilobites the antennae are long filaments. If the antennal "leg" regenerate is a return to an ancestral form of the appendage, it would have to be a throwback through millions of years before the Cambrian, long before insects existed, when the arthropod ancestors very improbably had fully segmented legs with paired apical claws. The antennal "leg" proves too much for the theory of its leg origin, and thus gives no support to the idea that the antennae are appendages of a formerly postoral segment of the trunk. The claim that the antennae are modified, primarily postoral legs needs stronger support than that derived from regeneration.

Heteromorphic regenerates have followed even amputation of the compound eyes. Experiments in eye removal on the cockroach and *Tenebrio* larva by Janda (1913) and by Křiženecký (1913) produced only small fingerlike outgrowths in place of the amputated eye, accompanied in most cases by a small regenerated eye. On the other hand, in experiments by Herbst (1896, 1900, 1902) on Crustacea, the amputation of an eye was followed by the regeneration of a truly antennalike appendage. If the antennal regenerate is interpreted as an ancestral reversion, we should have to assume that the primitive crustaceans had three pairs of antennae but no compound eyes, and that eyes were later developed on the first pair of antennae, which then were converted into eye stalks. To accept all this as truth requires great faith in imagination.

In further experiments Herbst found that in the Crustacea the formation of an antennal regenerate in place of an eye depended on the destruction of the optic ganglion, otherwise a new eye and eye stalk were regenerated. In the lower vertebrates, however, Goldfarb (1910) reports that the destruction of nerves to an amputated part has no effect on the regenerate; a salamander thus treated replaces a leg and its tail, a tadpole its tail, and an earthworm its head.

Considering the many known examples of abnormal growth of the appendages of insects, such as those recorded by Przibram (1910) in adults, and by Cappe de Baillon (1927) in the embryo, nymph, and adult of *Carausius morosus*, it is difficult to believe that any kind of abnormal growth can have any phylogenetic significance. All such things result from some disturbance of the growth factors, and would appear to have no more meaning than a two-headed rooster or a six-legged calf. I once saw in a circus a three-legged man, but I am not convinced our ancestors were tripods.

LETTERING ON THE FIGURES

<i>Aclp</i> , anteclypeus.	<i>For</i> , occipital foramen.
<i>af</i> , antennifer.	<i>FR</i> , frontal ridge.
<i>Ant</i> , antenna (<i>1Ant</i> , first; <i>2Ant</i> , second).	<i>Fr</i> , frons.
<i>Ap</i> , apodeme.	<i>frGng</i> , frontal ganglion.
<i>Apt</i> , cephalic apotome.	<i>Ge</i> , gena.
<i>Ar</i> , arista.	<i>Gn</i> , gnathal segments.
<i>AT</i> , anterior tentorial arm.	<i>Gnc</i> , gnathocephalic part of cranium.
<i>at</i> , anterior tentorial pit.	<i>Gng</i> , ganglion.
<i>Br</i> , brain.	<i>gnl</i> , gnathal lobe.
<i>cas</i> , circumantennal sulcus.	<i>Gu</i> , gula.
<i>Cb</i> , cibarium.	<i>HB</i> , hypostomal bridge.
<i>Cd</i> , cardo.	<i>hF</i> , hypopharyngeal fultura.
<i>Chl</i> , chelicera.	<i>hf</i> , fulcrum of hypopharynx.
<i>CL</i> , ecdysial cleavage line.	<i>HL</i> , hypostomal lobe.
<i>Clp</i> , clypeus.	<i>Hphy</i> , hypopharynx.
<i>cos</i> , circumocular sulcus.	<i>hs</i> , hypostomal sulcus.
<i>Cp</i> , carapace.	<i>Hst</i> , hypostome.
<i>CT</i> , corpotentorium.	<i>Hstm</i> , hypostomium.
<i>cvpl</i> , cervical plate.	<i>I-IV</i> , postoral head segments.
<i>Cvx</i> , cervix, neck.	<i>L</i> , leg.
<i>DT</i> , dorsal arm of tentorium.	<i>Lb</i> , labium.
<i>E</i> , compound eye.	<i>Lg</i> , ligament.
<i>emH</i> , embryonic head, blastocephalon.	<i>Lig</i> , ligula.
<i>Ephy</i> , epipharyngeal surface.	<i>Lm</i> , labrum.
<i>es</i> , epistomal sulcus.	<i>mcl</i> , muscles.
<i>Fl</i> , flagellum.	<i>mcs</i> , midcranial sulcus.
<i>fl</i> , first annulus of flagellum.	<i>Md</i> , mandible.
	<i>Md B</i> , base of mandible.

- mdFs*, mandibular fossa.
mdGng, mandibular ganglion.
ms, median suture.
Mt, mentum.
Mth, mouth.
Mx, maxilla (*1Mx*, first; *2Mx*, second).
MxC, maxillary cavity
N₁, pronotum.
Oc, occiput.
occ, occipital condyle.
ocs, occipital sulcus.
Pdc, pedicel.
PgB, postgenal bridge.
Pge, postgena.
PgL, postgenal lobe.
Phy, pharynx.
Plst, pleurostoma.
Pmt, postmentum.
Pnt, premandibular appendage (?).
Poc, postocciput.
PoR, postoccipital ridge.
pos, postoccipital sulcus.
PrC, preoral food cavity.
prmdGng, premandibular ganglion.
Prmt, prementum.
Prtc, protocephalon.
PT, posterior tentorial arm.
pt, posterior tentorial pit.
R, rostrum.
rNv, recurrent nerve.
rprmt, retractor muscle of prementum.
S, sternum, or sternal arms.
Scp, scape.
sge, subgena.
sgs, subgenal sulcus.
SIDct, salivary duct.
Slv, salivarium.
Smt, submentum.
sos, subocular sulcus.
St, stipes.
Stom, stomodaeum.
TB, tentorial bridge.
Tnt, tentorium.
Tor, torus.
ts, temporal sulcus.
V, ventral wall of head.
Vx, vertex.
y, suspensory rod of hypopharynx.

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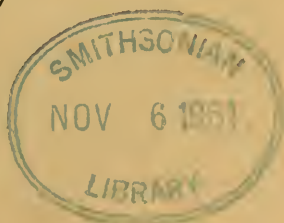
FOLK RELIGION IN SOUTHWEST CHINA

(WITH 28 PLATES)

By
DAVID CROCKETT GRAHAM



(PUBLICATION 4457)



CITY OF WASHINGTON
PUBLISHED BY THE SMITHSONIAN INSTITUTION
NOVEMBER 1, 1961



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PREFACE

In the fall of 1911 my wife and I, together with a number of missionaries bound for West China, boarded the steamship *Siberia* at San Francisco and started for Shanghai. Though radiograms were received en route stating that China was in a state of revolution, we went on to Shanghai, where we rented a building in the British concession. There we lived and studied the Chinese language until the revolution was over and the country was again peaceful. We then journeyed to Szechwan Province, where we spent most of our time until the late spring of 1948.

After being stationed for 20 years at Suifu 鈐府, now I-pin, I was transferred to Chengtu 成都, the capital of the province. At I-pin I gradually assumed responsibility for missionary work, but continued to study the language, completing the 5-year course being given for new missionaries. Included in this course were the Three-word Classic, the Four Books of Confucius and Mencius, the Sacred Edict, and the Fortunate Union. Later I also read and studied the Five Classics of Confucius. I found in these books high moral and spiritual ideals and teachings and began to have a wholesome respect for Chinese learning and culture.

In the fall of 1919 I entered the Divinity School of the University of Chicago for a year of postgraduate study. Here my studies included, besides religious education, the world's great religions, the history of religions, and the psychology of religion. Further courses taken at Chicago in 1926 covered anthropology, ethnology, and the psychology of primitive peoples and of primitive religion. My doctor's thesis, "Religion in Szechwan Province, China," was mainly the result of first-hand studies and research in the religions of Szechwan. This was published in 1928 by the Smithsonian Institution. During the summer of 1931 I took a course in field archeology under Fay-Cooper Cole of the University of Chicago, and during the following fall and winter I took courses in archeology, ethnology, physical and cultural anthropology, and methods of research under Professors Hooten, Tozzer, and Dixon at Harvard University.

During the period 1919 to 1939 I made 14 summer expeditions to different parts of Szechwan and the China-Tibetan border and a large number of shorter trips. Later, two summer vacations were spent among the Ch'iang. My missionary work often involved traveling

from one station or city to another or to outstations or smaller towns and cities. Three times on the way to and from the United States I passed through Kweichow and Yunnan Provinces. In 1936 travel for the museum of the West China Union University took me to Shanghai, Nanking, Tsī-an, K'aifeng-fu, An-yang, Si-an, Ch'ang-sha, and Peking, where I visited museums and libraries, interviewed scholars and scientists, and visited archeological sites such as An-yang, Lung-an, and the cave of Peking Man. During all these trips I took many notes and pictures. Of the West China provinces, I have lived in or visited Szechwan, Sikang, Shensi, Kweichow, and Yunnan.

In 1920 the opportunity came to study the Ch'uan Miao. This resulted in several articles for scientific journals and in the book, "Songs and Stories of the Ch'uan Miao," published by the Smithsonian Institution in 1954. Twice I visited the Lolo country and for several years made a first-hand study of the Ch'iang, spending three summer vacations and several shorter periods among them. One summer trip took me through Mu-p'ing among the Chia-jung, and three times I visited Tsagunao. Three trips through Tatsienlu to parts of Sikang or eastern Tibet afforded the opportunity of visiting lamaseries, meeting lamas and Living Buddhas, and witnessing a 3-day "devil dance," or, as the Tibetans call it, the festival (or dance) of the gods.

Beginning about 1930 it became increasingly evident to observers that the great changes taking place in China were having very important effects on the religious life of West China, especially evident in the uses of the temples and the worship in them. In 1928 two Chinese teachers assisted me in making a survey of the temples of I-pin or Suifu, the results of which were published in the Chinese Recorder. At this time few changes were evident in the temples. From 1941 to 1944, with the help of three university students, I made a careful survey of the temples of Chengtu, the capital of the province. The results were striking. In 42.4 percent of those that could be found there was no worship at all, and in 44.3 percent more, very little worship. Eight and one-tenth percent were used for other purposes but were also much used for worship. Only 5.2 percent of the temples were used for worship only, and nearly all of these were small. This survey was followed by shorter studies of the temples of Ya-an, Chia-chiang, Chia-ting or Lo-chan, Chi'ien-wei, and I-pin. It was evident that great and significant changes were taking place in the religions of West China, and an attempt was made to discover the causes of these changes.

In pursuing this study, which began in earnest in 1920, I have read

many books and articles, especially in English and in Chinese. It should be emphasized, however, that the main source of information has been the people of West China. I have endeavored to be objective, letting my opinions develop out of the information received and the observations made, rather than starting with theories and seeking evidence to prove them. While many of the most important facts and theories have been received from ordinary, unsophisticated people, they have also been discussed with Chinese of all classes, including students, old-fashioned scholars, and scientists. The information received has been checked and rechecked many times.

In this manuscript, the present tense is generally used. It should be borne in mind, however, that I am describing conditions, beliefs, and practices as they existed in West China before the modern changes took place. Many of them may not obtain at the present time.

China has produced one of the world's greatest cultures, in some respects the greatest. It has produced men of outstanding ability and character. It has had several of the world's greatest historians, poets, philosophers, and artists. In a number of her arts, such as lacquers, bronzes, and porcelains, she has led the world. She has had great religious leaders such as Confucius and Lao Tzu. All these have influenced every phase of her culture and religion. Yet the great mass of her people have been, until recent decades, illiterate farmers and laborers, whose customs and ideas were often very primitive. That these beliefs and customs have continued in China practically up to the present time is due at least in part to the fact that they have seemed to fit the situations, to explain natural phenomena, and to offer a satisfying philosophy of life.

The religious beliefs and practices of the common people have been modified by Confucianism, Taoism, and Buddhism and by their sects and the lesser religions. On the other hand, these have been profoundly influenced by the beliefs and practices of the common people. The religion of the common people, called by some animism, has been referred to as the real religion of China.

ACKNOWLEDGMENTS

I am indebted to many Chinese of all classes as well as to many occidental scholars for information that has made this manuscript possible. I wish especially to express my appreciation to Dr. C. T. Wu, Ph.D., a graduate of the University of Washington; to Mr. Wayne S. Kow, a graduate of the University of Denver, for assistance in translating and in writing the Chinese characters; to Prof. Lewis Walms-

ley, Ph.D., curator of the Department of Orientalia, Royal Ontario Museum, Toronto, Canada, for helpful suggestions; to Dr. Arthur W. Hummel, Orientalist of Washington, D. C., for helpful suggestions and criticisms; to my daughters, Mrs. Fred Russell and Mrs. Warner Edson, for drawing the maps and diagrams; to the John Simon Guggenheim Memorial Foundation for a fellowship making possible the completion of this work and for a financial grant for its publication by the Smithsonian Institution; and to the editors of the Smithsonian Institution for helpful corrections, criticisms, and suggestions.

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BY DAVID CROCKETT GRAHAM *

(WITH 28 PLATES)

BACKGROUND

GEOGRAPHY AND CLIMATE

West China is a land of abounding and fascinating wonders. It has a climate varying from warm-temperate to that of perpetual snow. It has many mountain ranges, with peaks of great grandeur and beauty, such as Wa Shan, Mount Omei, Minya Konka (over 24,000 feet high), and numerous others on the China-Tibetan border that are more than 20,000 feet in altitude. It has wide, U-shaped valleys in Sikang and western Szechwan, and many beautiful and often rugged V-shaped gorges carved through the mountains by the mighty rivers, some of which are in places over 2 miles deep, fed by hundreds of smaller streams. There are deserts, loess deposits, semiarid regions, rolling grasslands, plateaus, and fertile valleys, basins, and plains. Of the many great precipices, some of them overhanging, that at Mount Omei is 6,000 feet high and is believed by some to be the highest in the world. There are natural bridges, and deep funnels going down into the earth, often into solid rock, through which the water disappears, sometimes reappearing many miles away. There are waterfalls, balanced rocks, and pools of blue water surrounded by naturally formed yellow stone, like those of Yellowstone Park.

West China, which comprises nearly half the territory of China, includes the provinces of Ching-hai or Kokonor, Kansu, Shensi, Sikang or eastern Tibet, Szechwan, Kweichow, and Yunnan. It has a population of about 120 millions.

Richardson (1940, pp. 103-105) has pointed out that West China can be regarded as a series of plateaus, bounded by mountain ranges and cut by deep river valleys, which decrease in altitude from west to east. He divides these into three zones, north, central, and south. Farthest west on the north is Ching-hai or Kokonor, with an altitude of approximately 4,000 meters. East of Ching-hai is Kansu, with an altitude of from 1,500 to 2,000 meters. Farther east is Shensi, alti-

* Dr. Graham died at Englewood, Colo., on September 15, 1961, while this book was in press.—EDITOR.

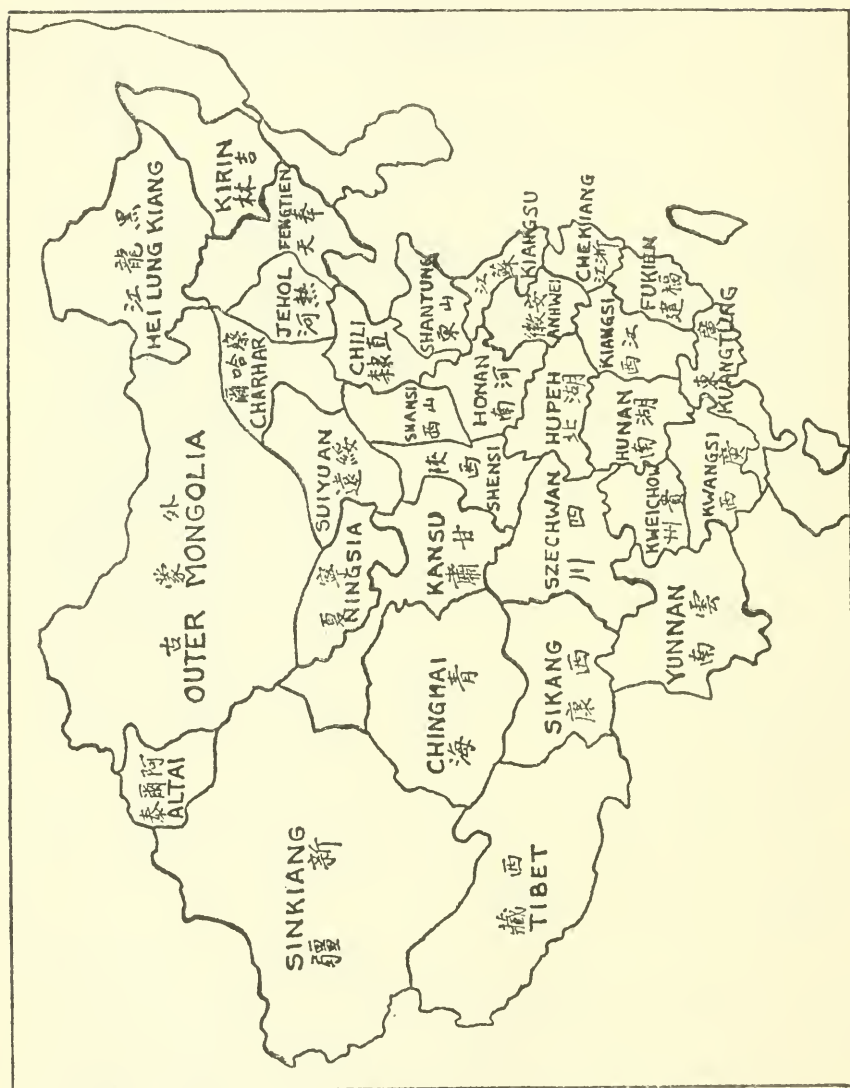


FIG. 1.—Map of China.

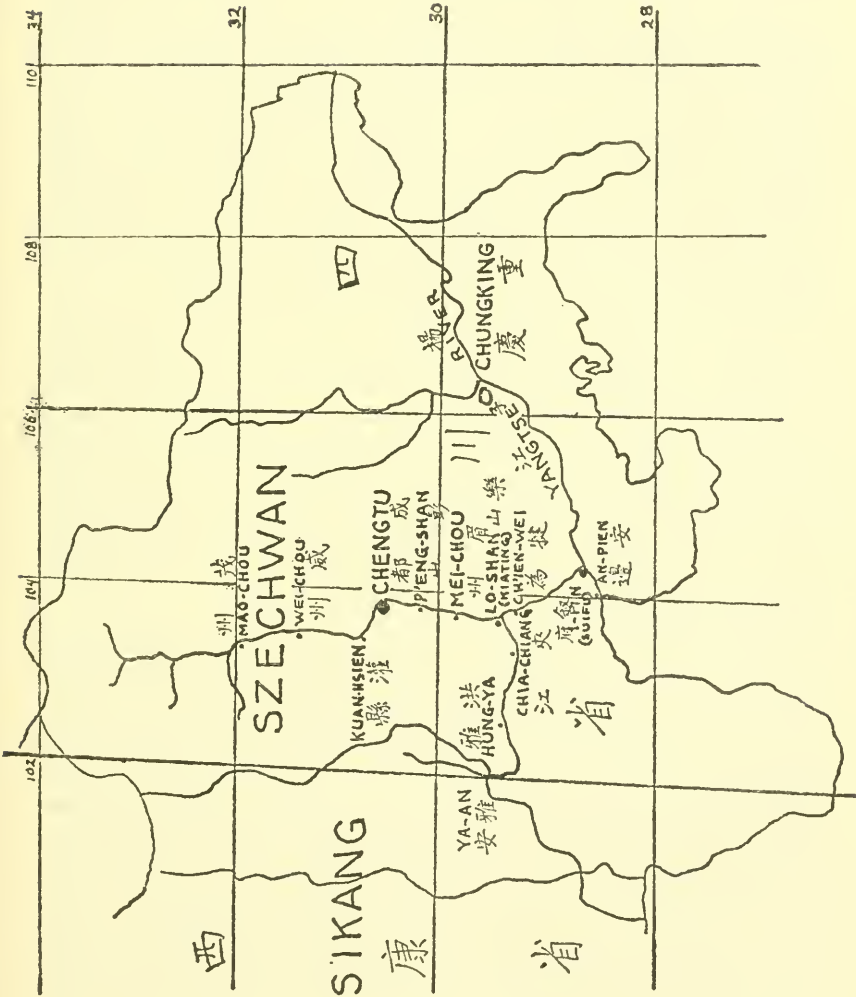


FIG. 2.—Map of Szechwan Province.

tude 1,000 to 1,500 meters, and still farther east is the Yellow River at an altitude of 500 meters. In the central west is Sikang, with an altitude of 4,000 meters. Crossing the "Szechwan Alps" to the east, we arrive at the Chengtu plain and the Red Basin, with an altitude of 300 to 600 meters. Across the Tapa Shan range, in the lower Yangtse Valley, the altitude is only a little above sea level. On the southwest we begin with the plain west of Talifu, where the altitude is 4,000 meters. East of this is the Yunnan plateau, with an altitude of 2,000 to 2,500 meters. This plateau includes several lake basins, some dry and some full of water, and several river valleys. Crossing the mountains on the Yunnan-Kweichow border, we reach the Kweichow plain, varying in altitude from 750 to 2,000 meters. Farther east are Hunan and Kuangsi, with an average altitude of 500 meters.

The climate of West China is strongly influenced by the altitude, the latitude, the oceans, and the mountain ranges. Szechwan is bounded by mountain ranges on all sides. On the west the "Szechwan Alps" act as rainsheds, so that the land farther west is much dryer than that of Szechwan Province. In the winter it is very cold and very dry, and but little snow falls. What does fall is evaporated by the dry air and never causes floods by melting, even in Tibet. The floods of the Yangtse River are caused by the summer monsoon rains in the Red Basin and the Chengtu plain and on the east side of the "Szechwan Alps."

The two ranges of mountains to the north of Szechwan, the Chingling Shan and the Tapa Shan, completely shut off the cold winter winds from Kansu and Shensi. That part of the Tapa Shan range on the east and the mountains on the borders of Kweichow and Yunnan Provinces on the south completely shut out the strong, tempestuous winds from the east and the south, so that Szechwan has no cyclones and no severe windstorms. On the other hand, these mountains are not high enough to shut out the moisture-bearing air and clouds, so that Szechwan enjoys a comparatively abundant rainfall. Furthermore, enough moisture enters Szechwan from the outside so that, with the natural evaporation of the moisture from the soil, the skies are cloudy nearly every day. The clouds prevent too rapid evaporation of the moisture from the soil and hold in the heat so that the winters are not so cold as to the north, the south, and the east. There are few severe frosts and little snow, and ice seldom forms on the surface of the water.

The soil of the Chengtu plain is rich alluvium deposited by the Min River—rich soil carried down in the summer from the moun-

tains. The plain is irrigated by the waters of the Min River and one or two smaller streams, divided into thousands of irrigating ditches. The water is plentiful, the soil rich, the yield is abundant, and there is never a failure of crops. This is one of the most thickly populated farming districts in the world.

The main part of Szechwan is the Red Basin, so called because it has a surface of purple-red sandstone, which in some places is 4,000 feet thick. The stone weathers rather easily and contains substances that turn into fertile soil. This new soil replaces the old which is eroded away in the heavy rains, so that the land remains continually productive. The term "basin" may be misleading, as the terrain is not flat. During the past ages foldings of the earth's surface occurred, so that there are several low, parallel mountain ranges between Chungking and Chengtu running from northeast to southwest. The farmers have terraced the land so that a very large percentage of it is cultivated, and with irrigation and fertilization the soil is very productive. Nearly all the mountains and hillsides that cannot be farmed are covered with forests, which are cultivated for the wood and lumber that they produce. Szechwan is by far the most thickly populated part of West China, with a population estimated at between 50 and 70 millions. It is one of the most favored places on earth, and has been called a Garden of Eden.

In Sikang or eastern Tibet the winters are long, cold, and dry, and the summers are short and have little rain. Crops can be raised to an altitude of about 14,000 feet. They are all summer crops, mostly of barley, but also of bearded wheat, buckwheat, fruit, and vegetables. In the lower altitudes that can be farmed, the people have large stone houses. In the summer their herds are pastured on the higher grasslands, and in the winter they are brought back home.

In Kansu the winters are a little shorter and the summers a little longer than in Tibet, but otherwise the weather is much the same. The main summer crop is wheat, and there is no winter crop. The country becomes progressively dryer until the Gobi Desert is reached.

In Shensi the winters are cold and dry, and the summers have moderate to low rainfall. Here winter wheat is grown, as it is also in Szechwan and Kweichow.

Yunnan has dry winters with warm, sunshiny days and cold frosty nights. In the late spring, summer, and early fall there is abundant rain, but crops must be irrigated in winter. Kweichow has a slightly heavier rainfall and is somewhat cloudier and warmer.

Captain W. Pitcairn, "the river man," who succeeded Captain Plant

as the river inspector on the Yangtse, compiled a record of the lowest and the highest water levels at the port of Ichang from 1877 to 1922. The lowest winter levels on the Yangtse River occurred in April 1 year, in December 2 years, in January 12 years, in February 15 years, and in March 15 years. The highest levels occurred in July 24 years, in August 11 years, and in September 11 years. He recorded the lowest and the highest water levels at Chungking from 1891 to 1922. From 1893 to 1922 the lowest water levels occurred in February 14 years, in March 15 years, and in April 1 year. The highest levels occurred in July 13 years, in August 13 years, in September 2 years, and in October 1 year. The following are the average monthly water levels for Ichang and Chungking, compiled by Captain Pitcairn (1923a and b) from the records of 30 years:

<i>Month</i>	<i>Ichang feet</i>	<i>Chungking feet</i>
January	2.6	2.2
February	1.5	1.3
March	2.7	1.7
April	7.7	5.2
May	15.4	11.4
June	22.6	23.4
July	30.4	38.2
August	30.7	38.0
September	29.2	26.4
October	24.2	26.2
November	14.0	13.3
December	6.3	6.0

In the year 1923 Captain Pitcairn obtained the records of the rainfall in numerous cities of Szechwan and noted all the rises or "floods" of the Yangtse River at Chungking of 4 feet or over, the highest being 28 feet. Every one of the rises in the water level of the Yangtse was found to be due to monsoon rains in the Red Basin of Szechwan.

Temperatures vary in every city and locality and are influenced by many circumstances, especially by the altitude and the distance from the Equator. It has been estimated that the temperatures on the western borderland of Szechwan vary about 3° F. for every thousand feet of altitude.

There is a great variety of soil in Szechwan, and the following general statement is an over-simplification. Loess is found in northern and western Szechwan, in Sikang, Kansu, and Shensi. It is a rich soil but is often in dry regions, and its fertility depends on rain and irrigation. North of Kansu and Shensi is the Gobi Desert. In north-western Szechwan, in western Sikang, and in Kokonor there are roll-

ing grasslands varying in altitude from 10,000 to nearly 16,000 feet. Yunnan is mountainous and has a high average altitude. It has plateaus, river valleys, and lake beds, some dry and some full of water, while in the north are great stretches of limestone. Kweichow is fairly mountainous, with some plateaus. The main soils of Szechwan are the alluvium of the Chengtu plain and the red soil of the Red Basin. Both of these are very rich, and there is sufficient rainfall and water for irrigation, so that these soils are very productive.

Coal, salt, and mineral deposits are found in varying degree in the provinces of West China. No coal occurs in western Sikang and little or none in the extreme west of Szechwan, but it abounds in the remainder of Szechwan and in Kansu, Shensi, Kweichow, and Yunnan. There are extensive salt deposits in Szechwan, and lesser deposits in southern Sikang and in Yunnan. Copper is found in Yunnan, Kansu, and Sinkiang, lead, iron, and zinc in Kweichow and Yunnan, tin in northern Yunnan, silver, sulphur, and antimony in Yunnan, gold in Szechwan, Sikang, Kansu, and Sinkiang, petroleum in Kansu, and natural gas in Szechwan, northern Kansu, and northern Shensi. The methods of extracting these materials from the earth were until recently very primitive.

The Ching-ling Shan range of mountains between Kansu and Shensi on the north and Szechwan on the south, and its continuation eastward toward the coast, divides China into two distinct areas—north China and south China. To the north the main crops are wheat, kaoliang, and millet. Animal-drawn carts and wagons are used for transportation, the animals used being horses, camels, and mules. In the south the main crops are rice, tea, mulberries, bamboo, maize, tobacco, sugarcane, and vegetables. Transport is generally by laborers using carrying-poles, and the principal animal (aside from the pig, dog, and cat) is the water buffalo. Szechwan is in south China, and Kansu and Shensi are in north China.

In Kansu and Shensi deforestation has resulted in very serious erosion of the soil, which it may take centuries to reforest. In other parts of West China, mountains and hillsides are often covered with forests and shrubbery. In the Ch'iang and other regions where there is much grazing by sheep and goats, much of the lower land is destitute of trees, though higher altitudes are covered with forests. In Yunnan and Kweichow fires have burned off some of the forest land, while in several provinces overcultivation has led to deforestation.

Of very great importance, of course, are the rivers and streams of West China, especially the great Yangtse and its tributaries, which are used for irrigation, travel, and transportation.

HISTORY

The record of man's first appearance and way of life in West China is lost in antiquity. The many natural caves and rock shelters for the most part show no traces of human habitation until recent centuries. The climate of much of West China, especially of Szechwan, is warm-temperate, and we may perhaps conclude that generally prehistoric man in West China constructed his own habitations and was not a dweller in caves and rock shelters.

In November and December of 1925 Dr. N. C. Nelson, associate curator of archeology in the American Museum of Natural History, accompanied by Walter Granger, a paleontologist, conducted an expedition in the Yangtse Gorges as far as Wan-hsien. They collected many stone artifacts and some pottery sherds, which are now deposited in the American Museum of Natural History (Nelson, 1926).

Rev. J. Huston Edgar collected many chipped- and polished-stone implements in Szechwan and eastern Tibet, and a few red neolithic sherds at Wei-chou, nearly all of which were deposited in the museum of the West China Union University. I collected two boxes full of finely polished stone implements near Lo-piao, south of Suifu, and a few chipped- and polished-stone implements near Ch'ien-wei and elsewhere, which were also left in the museum of the West China Union University. In 1937 Dr. J. G. Andersson, one of the discoverers of the cave of Peking Man, headed an archeological surveying expedition into Sikang. Other members were Mr. Chou, a geologist on the staff of Szechwan University, Mr. Hsieh, an archeologist of the Academia Sinica, and myself. On this expedition we found a number of sites of prehistoric man, some of which were apparently neolithic, yielding pottery and polished-stone implements, yet not one paleolith was recognized and not one chipped-stone implement was found.

The theory that most archeologists and scientists have accepted, on the evidence now available, is that prehistoric man was kept out of West China by dense forests until he had developed tools with which he could cut down trees and the use of fire to burn them; that he lived in dwellings of his own construction, and that he was an agriculturist. It is believed that he came to West China on rivers and streams by means of boats or rafts. However, very little scientific excavation has been done in West China, and further excavations and discoveries may make necessary a revision of this theory. It has recently been reported that a skull of a paleolithic man was found in Szechwan.

After a careful study of the stone implements from West China in the American Museum of Natural History and in the West China

Union University Museum, Dr. Cheng Te-k'un classified them as follows:

1. Mesolithic Period (probably 5000 to 3000 B. C.)—characterized by chipped-stone tools which were the products of either a pebble or a flake industry.
2. Early Neolithic Period (3000 to 2000 B. C.)—represented by some chipped-and-polished stone tools.
3. Late Neolithic Period (2000 to 1200 B. C.)—represented by some chipped-pecked-and-polished and some polished-stone tools, which have been found to be associated with a series of pottery.
4. Aneolithic Period (1200 to 700 B. C.)—represented by some highly finished stone tools and the contents of the cultural stratum of the Hanchow site. (Cheng Te-k'un, 1942a, pp. 1-16; 1947, pp. 46-47; 1957, pp. 98-103, 130-135.)

The pottery of Szechwan has been classified by Dr. Cheng Te-k'un (1945b, pp. 2-3) into the following stages:

Stage 1. Prehistoric Period (3000-1200 B. C.)—represented by the potsherds found at Chiang-wei Ch'eng, Wei-chou, and along the Yangtse Gorges.

Stage 2. Chou Period (1200-500 B. C.)—represented by the pottery from the cultural stratum of the Hanchou site.

Stage 3. Ch'in-Han Period (500-1 B. C.)—represented by the gray wares from the slate tombs of Li-fan.

Stage 4. Han Chin Period (A. D. 1-500)—represented by the funerary objects from the cave and brick tombs of the Han and Chin dynasties.

Stage 5. T'ang period (A. D. 501-900)—represented by a part of the vessels from the Ch'ung-lai kiln site.

Stage 6. Sung period (A. D. 901-1300)—represented by a part of the pottery found at the Liu-li-ch'ang kiln site and by the Sung grave jars.

Stage 7. Ming Period (A. D. 1301-1600)—represented by the funerary pottery of the Ming tombs.

Stage 8. Ch'ing Period (A. D. 1601-1900)—represented by the Sao-chiu-fang wares manufactured at Lung-chang.

No bronze or metal tools were found with Stage 1 or Stage 2 pottery, but both iron and bronze tools and weapons have been found with Stage 3 pottery, leading to the conclusion that West China, at least Szechwan, did not have a bronze age, but advanced directly to the bronze-iron age.

Before the coming of the Chinese into Szechwan, most of the Red Basin and the Chengtu plain were occupied by the Shu, whose capital was near Chengtu, and the Pa, whose capital was near Chungking. These were Shan or Tai people, who were related. In his book, "The Shans," Cochrane (1915, pp. 5-17) infers that the Shans inhabited the Yangtse Valley all the way from the watersheds of western Szechwan to the coast. South and west of the Shu and of the Pa people were numerous other tribes, most of them smaller and weaker.

The first historical reference we have to the Shu or the Pa people

is in 1122 B. C., when the Shu united with the Chou people and others, overthrew the Shangs, and established the Chou dynasty.

In 316 B. C. Shu attacked Pa, and Pa appealed to Ch'in for help. The Ch'in armies first attacked and subdued Shu, then conquered Pa. Later Ch'in used the men, grain, and boats of Szechwan and attacked and subdued Ch'u in the east. Other Chinese leaders in later centuries used the same strategy.

In the year 311 or 310 B. C. the city of Changtu was built. The histories report that it had a wall 12 *li* in length and 70 feet high. Later, in order to make the rule over Szechwan more stable and permanent, thousands of Chinese families were moved from the north and the east into the Chengtu plain and the Red Basin. In time a majority of the people were Chinese, and the Shans were either absorbed or moved southward.

Before the coming of the Chinese the culture of the Shans was high. The Chinese people also brought their culture with them, and Szechwan became, and has generally been since, a place of learning and high culture.

In 250 B. C. Li Ping was appointed governor of Szechwan. He showed remarkable ability and is credited with the work of perfecting the irrigation system of the Chengtu plain. Owing to the rich alluvium and the superb irrigation, there is never a famine in this district, it being one of the most fertile and populous farming regions in the world.

In 206 B. C. the Ch'in dynasty fell and the Han dynasty was established. Under the Han rulers China prospered both materially and culturally, and this prosperity was shared by Szechwan. There was trade with India through Tibet and Burma and trade with southeast China through Kweichow. Through the Kansu corridor or "the north-west passage" there was trade with western Asia and possibly with Egypt. Chinese silks were worn by the fashionable women of Rome, and Chinese pottery was carried westward by the "ship of the desert." There was much trade with East China over the Yangtse and its tributaries, and a trade route led northeastward to Peking. Evidence of the material and cultural prosperity of Szechwan during the Han period is found in the elaborate cave-tombs and graves of ornamented bricks throughout the province. These contained miniature terra-cotta houses, towers or pavilions, vases, tables, stoves, kitchen utensils, dishes, horses, cows, sheep, pigs, dogs, chickens, ducks, pigeons, geese, and a great variety of human figures including cooks, house servants, soldiers, farmers, beautiful maidens, and elderly women. In these

tombs are also found money, bronze and more rarely iron ceremonial and cooking vessels, and ornaments and other objects of gold, silver, bronze, and jade.

At the end of the Han dynasty China was divided into three warring kingdoms, Wei, Shu, and Wu. Shu included Szechwan, and here the last Han emperor took his final stand. His imperial tomb is on the grounds of the Wu-hou-ssu, a Taoist temple outside of the Great South Gate of Chengtu.

The non-Chinese people of West China have generally been peaceful and submissive when the Chinese government was strong and prosperous, but in times of turmoil and weakness they have taken advantage of the situation to rise in revolt and to assert their independence. Near the end of the Han dynasty and during the Three Kingdoms Period many of the aborigines revolted, and Chu-ko Liang (A. D. 181-234) and Chang Fei (d. A. D. 220), two of China's greatest military strategists, became famous for the work they did in reducing them to submission.

After the conquest of the Shu and the Pa people by the warriors of Ch'in during the fourth century B. C., the plains and the valleys of Szechwan were gradually occupied by the Chinese. During the following centuries this migration extended into Kweichow, Yunnan, and eastern Tibet or Sikang. The non-Chinese people were pushed out of the lower valleys into the higher altitudes, where their descendants now live. The Shan or Tai people, called the P'o Jen (local Bei Ren), continued to occupy the region of I-pin (or Suifu) until the year 1573. In that year a war was waged against them, and they were driven southward. Today there are Shan people in Yunnan, Burma, and Thailand.

The time between the Han dynasty and the T'ang dynasty, A. D. 221 to 618, was one of almost constant turmoil and short reigns. It was a time of low official morals, many civil wars, and insecurity. The T'ang dynasty, which ended in A. D. 906, was a period of material prosperity, extensive trade, international contacts, and high cultural attainments, and there were great poets, painters, and philosophers. In pottery the famous tri-colored T'ang was developed, and in some more progressive kilns monochrome porcelains were produced. Traders came from foreign countries, bringing with them their religions, Nestorianism, Manichaeism, and Islam. Szechwan shared in this material prosperity and cultural advance.

After a brief interregnum known as the Five Dynasties, the great Sung dynasty began in 960 and lasted through several political up-

heavals until A. D. 1280. In spite of several invasions from the north, China again flourished, and in Szechwan there were three kilnsites where excellent porcelains were made, the largest one being at Liu-li-ch'ang. During this dynasty Arabs carried on an extensive trade with ports in southeast China, and a colony of Jews settled in the northern Sung capital, where they retained their identity until the middle of the 19th century.

The shorter Yuan dynasty (1280-1368), when China was again ruled by foreign invaders, was followed by the glorious Ming dynasty (1368-1644), whose rulers were Chinese. At the end of this period Chang Hsien-chung led a large army into Szechwan and declared himself "king of the west." He adopted a policy of ruthlessly exterminating his opponents. Unnumbered millions are said to have been executed. Although most of these reports are exaggerated, it is certain that more than one million people in Szechwan were killed by Chang and his army, and that many others fled from the province, so that Szechwan was nearly depopulated (Parsons, 1957, pp. 395-396). During the Manchu dynasty West China experienced a great migration, especially into Szechwan, from nearly every province of north, east, and south China. (Ibid., pp. 396-398.)

For millennia the oceans were a barrier to Chinese trade and cultural contacts. During the T'ang dynasty trade developed with India and other countries by means of Arabian ships which came to southeast China. During the Sung dynasty the Chinese had a navy and began to navigate the seas, leading to an extensive foreign commerce with many exports and imports. Chinese ships traveled to Japan, the Philippines, Singapore, Java, and even to India and Iran. During the Ming dynasty Chinese ships made expeditions to Java, Sumatra, India, Ceylon, Arabia, and Africa.

Portuguese vessels arrived on the China coast in 1522. The Spaniards took possession of the Philippines in 1565, and began to trade with the Chinese coastal cities, followed soon after by the Dutch and the English. As trade with foreign countries developed through the Chinese seaports, it reduced to insignificance the overland route through Kansu and western Asia. Western impact on the coastal cities became stronger and stronger and has influenced every part of China, including the remotest regions in the west.

THE PEOPLE

Anthropologists have divided the yellow or Mongolian race into three groups; the Asiatic continental, the American Indian type, and

certain groups of the southwestern Pacific Islands. The East Asia continental group is described as having dark hair, straight or wavy, dark eyes, a yellow-brown or "yellow" complexion, shovel-tooth incisors, and a Mongolian slant or an epicanthic fold to the eyes. This classification is probably oversimplified, for careful studies have shown great variations in the three groups. The Russian physical anthropologist, S. M. Shirokogoroff, made an extensive study of the Chinese of eastern China and Kwangtung Province, and on the basis of his findings he classified the Chinese into three main groups, the northern, the eastern (east-central), and the southern. His main conclusions (1925, pp. 55-56) are as follows:

1. The stature of the eastern Chinese is shorter than that of the northern, and that of the southern Chinese is shorter than that of the eastern Chinese.
2. The variations in each group are greater than normal, and are probably due to the crossing of two or more racial types with different statures.
3. The average stature of students is higher than that of the population as a whole.
4. The Chinese of Kwangtung have a greater arm length than other Chinese groups.
5. The Chinese of eastern China have relatively short thighs and long tibias, making their legs relatively longer and thus influencing their stature.
6. The trunks of eastern Chinese are shorter except those in Anwei and those in Kwangtung. The trunks of northern Chinese are relatively long.
7. The length of the head and the neck of the inhabitants decreases as one travels from the south to the north, whereas the stature increases.
8. Except in Chekiang Province, the cephalic index is higher among the eastern Chinese than among the northern and southern Chinese.
9. The nasal index decreases from the north to the south.
10. The skin color seems to vary with the amount of sunlight.
11. The Mongolian slant of the eyes is more evident among the southern and eastern Chinese than among northern Chinese.
12. There is evidence of a mixture of a darker race, probably negroid, with the people of Kwangtung Province.

Shirokogoroff further divides the Chinese into four main divisions and two lesser divisions.

No such thoroughgoing study has been made of the Chinese in West China. Dr. W. R. Morse collected about 3,000 measurements of Chinese and non-Chinese in West China, but all these were lost or stolen from him. With the expenditure of much time and money he again proceeded to collect measurements of Chinese and of tribes-people, and obtained over 3,000 in all. The bare measurements were published in a supplement to the *Journal of the West China Border Society*, but Dr. Morse died suddenly while working to prepare the

results and conclusions for publication; hence the work was never finished.

The Chinese of West China, especially of Szechwan Province, are an amalgamation of peoples from north, east, and south China, from virtually every province and every group including the Hakkas. Outside the north gate of Chengtu a colony was found whose ancestors had come from Canton generations ago and who still spoke Cantonese. One of the greatest migrations to Szechwan took place after the death of the aforementioned Chang Hsien-chung, the tyrant who killed or frightened away most of the population of Szechwan near the end of the Ming dynasty. A large proportion of the people of Szechwan, when asked whence their ancestors came, reply that they came from Hu-kwang, that is, Hupeh and Hunnan, Kwangtung and Kwangsi.

The tribespeople of West China are divided by Bourne and Davies into three groups. Bourne divides them into Mon-kmer, Shan, and Miao. Davies divides them into Mon-kmer, Shan, and Tibeto-Burman. Under the Mon-kmer Davies includes the Miao-yao, the Mon-chia, and the Wa-paloung groups. Under the Shans he places all groups speaking the Shan or the Tai dialects, and under the Tibeto-Burman family he includes the Hsi-fan, the Lolo, and the Kachin groups. (Couling, 1917, pp. 1-2; Davies, 1909, pp. 331-347). Dr. Cheng Te-k'un (1945d, pp. 1-2) divides the non-Chinese into the Tibeto-Burman family, the Tai-shan family, and the Miao-P'u family, and each of these he subdivides into several groups. Rev. E. C. Bridgeman, in an article which is a translation from the Chinese with annotations (1859, pp. 1-26), gives sketches of 82 tribes, presumably all of them in Kweichow Province.

Rev. John B. Kuhn, a missionary of the China Inland Mission, began on August 2, 1942, a 5-month journey through Yunnan Province for the purpose of ascertaining the number of aboriginal tribes in that area. In a pamphlet which he published he reports that he actually found 100 tribes, mentioning by name 40 tribes of Lolos, 8 of Tai, 3 of Min-chia, 4 of Miao, 5 of Tibetan, 21 of Burmese, and 4 of unclassified origin (Kuhn, John B., pp. 22-26).

As for Sikang, Mr. Chuang Hsüeh-pen (1940) mentions the Hai-fan and the Lolos as the largest groups, and the Mo-shi (Mo-so?), the Miao, and the Tai as lesser groups. In western Szechwan there are at least the Hsi-fan, the Chia-jung, the Ch'iang, the Wa-Ssu, the Hei-shui, the Lu-hwa, and the Bo-lo-tzu. There are other such groups in Hunan, Shensi, Kansu, and Chinghai. It is safe

to say that there are at least 150 tribes or ethnic groups in West China, with a population of about 20 million.¹

The following is an estimate of the population of the provinces of West China about 1935:

<i>Province</i>	<i>millions</i>
Szechwan and Sikang.....	75
Kweichow	11
Yunnan	12
Hsinchiang or Kokonor.....	2½
Kansu	6
Shensi	17
Total ²	123½

It is evident that there are approximately 120 million people in West China, of whom about 100 million are Chinese. The population of Szechwan is between 50 and 70 millions. Culturally it is the most important part, one might even say the heart, of West China.

There is no city, village, region, or ethnic group in West China to which influences have not penetrated from East China and from the rest of the world. On the other hand, owing to the meagerness of the facilities for travel, transportation, and communications, and because of comparative isolation, there are many localities and groups in which change, material progress, and modernization have been slow.

ECONOMIC LIFE

We have already stated that the first inhabitants of central West China probably came by river. Certain it is that travel by water in boats and on rafts has for millennia played a large role in the lives of the people of West China. Everywhere wooden boats are used, and there are places such as the Ya River between Ya-an and Lo-shan where there are more bamboo rafts than boats. The wooden boats vary in size from a small canoe to a great cargo vessel requiring 20 to 30 men to navigate it, and an even larger number on the rapids. Houseboats are of medium size. Then, too, there are smaller boats, one called *wu-pan* because it has five boards on a side, and another called *san-pan* because it has three boards on a side. Some of the

¹ The writer has had first-hand contacts with the Wa-ssu, the Chia-jung, the Bo-lo-tzu, the Hsi-fan, the Lolos, and the Tibetans, and more intimate contacts with the Ch'uan Miao and the Ch'iang. Some customs and religious practices of the Ch'uan Miao, the Lolos, the Ch'iang, and the Tibetans will be briefly described later.

² Compare Cressy, George Babcock, 1934, p. 55.

largest cargo boats have 2 large oars, each worked by many men, while others have from 2 to 20 or more oars, each generally worked by one man, though sometimes by two men. When going upstream and winds are favorable, sails are used; otherwise the boats are pulled upstream by strong bamboo ropes or cables. In recent decades steamers have appeared on the Yangtse and other large rivers. During high waters ocean steamers can travel as far as I-pin, and small steamers are able to reach that city throughout the year.

Besides the large rivers, there are many small streams in West China that are navigable by small boats. In some places these streams are crossed by bridges, but generally they are crossed by means of ferryboats. The number of wooden boats that can be seen at Ichang, Chungking, I-pin, Lo-shan, Chengtu, and many other cities and towns on the Yangtse River and its tributaries is evidence of the tremendous amount of travel and traffic on the waterways of West China. Hundreds of thousands of men find employment in this way.

Overland travel began at least 3,000 years ago. The red neolithic pottery of Kansu dates from 3000 to 500 B. C., and sherds of this pottery have been found at Chiang-wei-ch'eng near Wei-chou, which is on one of the highways going through Sung-p'an to Kansu. The people of Pa and Shu probably had overland contacts with the Chinese as early as 1000 B. C. There have been several main trade routes into West China, and some lesser routes, and from these, roads and footpaths have branched out into all the country, so numerous that one is reminded of the arteries, veins, and capillaries of the human body.

Over these roads men and women walked, rode, or were carried in sedan chairs. The wheelbarrow was used in and near Chengtu, but was not to be seen in most parts of West China. Single workmen carried loads suspended on the two ends of carrying-poles, and two or more men carried heavier loads suspended from large poles. Some pack animals were used in the lower altitudes, and many more were employed in the higher altitudes where the grazing is good. In the western highlands where the altitudes are under 13,000 feet, laborers often carried their loads on their backs. Tea carriers between Ya-an and Tatsienlu have been known to carry in this way as much as 400 pounds. In Kansu and Shensi camels and horsecarts are used.

For over 2,000 years one of the most common Chinese coins was a round coin with a square hole in the middle, generally called a "cash." It was made of bronze, copper, brass, or iron, and varied from a little over half an inch to about an inch and a half in diameter. Most

modern cash were made of brass and were nearly an inch in diameter. These cash were strung on strings supposedly with one thousand cash on a string, but almost always less, and were divided into sets of one hundred or fewer cash each. Each string of one thousand cash weighed several pounds. When making a payment, these strings were carried on men's shoulders or in baskets on the end of carrying-poles, and often it took several men to carry enough cash to make one payment.

Money also took the form of lump silver, which was measured by weight. An ounce, called in Chinese *liang*, was known in English as a tael. Ten ounces, or a *ting* was called in English a shoe or an ingot.

In the Ming dynasty silver dollars were imported from Spain and Mexico, and later from France, Canada, and the United States. Late in the Manchu dynasty the Chinese made and used their own silver dollars, virtually all of them manufactured in the provincial mints. These dollars gradually replaced "lump silver" in the markets.

Paper money was used in China as early as the Sung dynasty, but its use was generally limited because of its instability, cheapness, and destructibility. Soon after the establishment of the Chinese Republic, in 1912, Chinese bank bills began to appear, and their use gradually increased until in 1940 they had entirely replaced lump silver and silver dollars in the Chinese markets. At first they were issued for 10 cents, 20 cents, 50 cents, \$1, \$2, \$5, and \$10. Later, owing to inflation, they were issued for \$20, \$50, \$100, \$400, \$500, \$1,000, \$5,000, \$10,000, \$50,000, and \$100,000. In the late spring of 1948 1 American dollar exchanged for 2 million Chinese dollars.

Although there were Chinese banks at least as early as the Sung dynasty (Kirby, 1954, p. 145), there were few banks in West China during the Manchu dynasty, and these were all in the large cities. While they were very useful, they were far too few in number. Soon after the founding of the Republic in 1911, some provincial banks were established, and some of these printed their own bank bills. The writer has in his possession some bank bills that were issued at about this time by the Bank of Kweichow. After 1927, when the National Government became more firmly established, the Bank of China (Chung Kuo Yin Hang), the Farmers' Bank of China (Chung Kuo Nung Min Yin Hang), and the Central Bank of China (Chung Yang Yin Hang) opened branch banks in the larger cities all over China, and each issued its own bank bills. The government also encouraged the opening of provincial banks without the privilege of issuing bank bills. The banking facilities were greatly improved, but were generally not available to poor people or to people on farms and in villages.

In cases of desperate need, people had to sell or pawn their possessions, or borrow money from loan sharks who often charged from 40 to 50 percent on loans of from 3 to 5 months. Interest on loans was generally very high.

Rents were also high, rents on houses being generally, though not always, paid in money. Farm rents were generally paid by giving the owner a generous share of the crop.

A very important and sometimes difficult problem in West China was the transfer of money or credit from one city to another in the same or in a distant province, or to some foreign country. For a person to carry money himself incurred the danger of being robbed. To send the money by a friend incurred the same danger, and also the possibility of the money being embezzled by the friend. One method often used was to give the money to a reliable firm that had branches in distant cities. The firm would deliver the money where and to whom it was desired. Another method was to sell a check on a bank or a mission treasurer in Hankow, Shanghai, or in a foreign country, in which transaction the sender often received a premium. In recent years postal money orders were available, or the money could be transferred through a bank.

In 1939 it was estimated that in the province of Szechwan there were 8 million hogs, 2 million water buffaloes, and 1 million cows. In the highlands, especially those inhabited by non-Chinese people, there are herds of sheep and goats, and in eastern Tibet or western Sikang herds of sheep and great herds of yak. In nearly every province there are horses and mules. In Kansu and Shensi there are horses, camels, sheep, and goats. In Yunnan and Kweichow there are water buffaloes, donkeys, mules, and cattle, besides sheep and goats. Everywhere there are dogs, and nearly everywhere cats and chickens. Ducks and geese are raised where there is plenty of water.

On the Chengtu plain and the Red Basin, where it seldom freezes or snows and the frosts are not severe, crops can be raised throughout the year. Two main crops and as many as five crops of vegetables can be raised in one year on the same soil.

Among the Tibetans the main food is tsamba (parched barleymeal), tea, mutton, milk, butter, and cottage cheese. This is supplemented by wild vegetables, and in the lower altitudes by vegetables and fruits. In the rough mountain lands at lower altitudes, such as the regions of the Ch'iang, the Lolos, and the Miao, the main food is generally boiled cornmeal. This is supplemented by wheat, barley, buckwheat, fruit and vegetables. Among the Chinese and others in the lower altitudes,

rice is the principal food, supplemented by vegetables, meat, eggs, and fruit. Fish are available near the streams and are gladly eaten by any who can obtain them.

In his book "Studies in Chinese Life," Adam Grainger (1921, pp. 105-125) listed the following foodstuffs grown and used in Szechwan province: Grains: wheat, barley, oats, millet, maize, buckwheat, sesame, and Job's tears; beans: broad beans, soya beans, kidney beans, knife beans, vigna beans, flat or Omi beans, and red beans; five varieties of lentils, and white peas, golden peas, and speckled peas, sweet potatoes and yams, several kinds of taros; at least five kinds of turnips or radishes, carrots, cucumbers, marrowing gourds, melons, and six varieties of eggplant; green vegetables: lettuce, several kinds of cabbage, beets, rape shoots, mustard, spinach, celery, smaranthus, *han-ch'ai*, chrysanthemums, leeks, onions, garlic, bamboo shoots, and lotus flowers and leaves; others are water chestnuts, arrowheads, mushrooms, dried lispens, and several kinds of pepper and ginger; fruits: cherries, loquats, mulberries, apricots, several kinds of plums and peaches, crabapples, several varieties of pears, pomegranates, quinces, several kinds of grapes, persimmons, and oranges, jujubes, olives, and wild fruits; nuts: walnuts, chestnuts, and peanuts; several varieties of sugarcane and many varieties of tea; meats: pork, beef, mutton, chicken, duck, geese, fish, crab, shrimp, snail, and the flesh of the silkworm pupa. Another farm product is honey.

To this list should be added Irish potatoes, pumaloes, and several kinds of squashes and pumpkins, and many varieties of beans that he does not mention. Also, he fails to mention the pigeon, which is quite common.

It is evident that there is a great variety of foodstuffs in West China, especially in Szechwan. In some localities the meat of wild birds and wild animals can be obtained. Meat of monkeys, tigers, or leopards is considered a delicacy. Edible species of wild bamboo shoots are found in some of the high mountains, and there are wild berries, fruits, and vegetables. In the mountains, especially near and above the timber line, many varieties of wild herbs are gathered and used or sold as medicines.

Other important products of the soil in West China are wood oil, rape or mustard oil, castor oil, white wax, hemp, cotton, paint, wood and lumber, bamboo, tobacco, and opium.

Wood oil is abstracted from the nuts of the wood oil or *t'ung-yu* tree. The trees generally grow on rough hillsides where little or nothing else can be planted. After the oil is squeezed out, the husks

are made into large, round cakes which are used as fertilizer. The yield of oil is about 40 percent of the weight of the nuts. The oil is boiled about 2 hours to produce varnish. It is also used as an adulterant in lacquer-varnish and is mixed with soot to make Chinese ink. The oil is used locally in West China and is exported to East China and to foreign countries.

Two varieties of rape are grown in China, the *ta-yu-ch'ai* or big oil vegetable, and the *hsiao-yu-ch'ai* or little oil vegetable, both members of the cabbage family. They are planted over vast areas, especially in Szechwan and eastern Sikang. They bloom in March and are harvested in April. When the plants are in blossom, whole areas are colored a beautiful yellow. The small buds and tender leaves may be eaten, and the dry stalks are used for fuel. The oil is commonly used for cooking, for fuel in lamps, and in the manufacture of soap. The dry cakes, after the oil is pressed out, make very good fertilizer.

Castor oil, extracted from the nut of a small tree which grows in lower altitudes, is used for medicinal purposes.

White wax is produced by a tiny insect which is raised in Chien-ch'ang Valley in northern Yunnan. The eggs are transported to Szechwan in April by carriers who travel by night. In the region of Lo-shan and Mount Omei, the eggs are placed on small green twigs of the ash or the privet tree, where they soon hatch out. The insects deposit the wax on the twigs, and later the twigs are cut off and immersed in boiling water, melting the wax. It is then molded into large, round cakes for storage and shipping, and used as a coating for candles and pills, to make paper glossy, to polish jade, soapstone, and furniture, and to give luster to cloth (Couling, 1917, p. 594). Much white wax is shipped from Szechwan to other parts of China.

Several varieties of hemp are raised at an altitude of up to 7,000 feet. It is made into thread, then into string or ropes, sackcloth, and clothing. The clothing generally worn by the Ch'iang people is made of coarse, undyed hemp cloth, which is a dull white in color. Formerly the Ch'uan Miao of northern Yunnan wore this kind of clothing, and for this reason they were called the White Miao.

Cotton is grown in the lowlands of central and south China, and even in parts of Shensi. There are few cotton mills in West China, the cotton generally being made into thread by women in their homes and woven into cloth on hand looms. It is dyed indigo blue, made into clothing, and worn by the Chinese and by some non-Chinese. Cotton is not raised in sufficient quantities to meet local needs, hence much manufactured cloth is imported into Szechwan.

The uses of cotton cloth are many. Most of the clothing of the Chinese and of some non-Chinese is made of cotton cloth, even their shoes, sometimes including the soles. Cotton is also used to make thread, bed coverings, curtains, and boat sails.

Bamboo of many species and in great quantities is raised in Szechwan, Kweichow, Yunnan, and in eastern Sikang. The young and tender shoots are cooked and eaten with relish. The small twigs and the leaves are used for fuel. The large *nan* (locally pronounced *lan*)-*chu* is used to make rafts and long tubes or pipes for irrigation and for the transfer of salt water to central places where the water is evaporated to make salt. Bamboo is made into pens, pen holders, chopsticks, cups, dippers, sifters, boxes, vases, money containers, mats, hats, chairs, couches, tables, sedan chairs, cables, the supports of straw roofs, and partitions and walls of houses with or without whitewashed coverings of clay. Even this long list is far from complete.

The silk industry originated in China. What are almost certainly silk fibers and cocoons have been found in archeological remains of the 14th century B. C. In Szechwan silk production flourishes all over the province up to an altitude of 3,000 feet. The silk produced in 1903 in Szechwan was estimated by Hosie to be worth 15 million taels (Couling, 1917, pp. 515-516).

In Szechwan the silkworms are hatched out in small, shallow bamboo baskets called *po-chi*. They are fed on mulberry leaves until they spin their cocoons, when they are thrown into boiling water, which kills the pupas. While still in the water the silk is wound onto large spools. Later it is dried, rewound, and then woven into cloth. The dead pupas are eaten as food. The mulberry trees are grown by farmers, the tops being cut off so that the trees will not grow too high. The cloth is generally dyed and made into clothing, pillow slips, bed covers, curtains, and embroideries. Very beautiful embroideries are made in Szechwan. In recent decades steam filatures and reeling houses have been established, and schools opened in the main centers to teach and encourage the improvement of sericulture (*ibid.*, p. 516).

Tobacco is raised in almost every province of China. It is used as snuff in Tibet and to a slight extent among the Chinese. Smoking is common among both men and women, Chinese and non-Chinese. One method of treatment is to remove the veins, treat the leaves with ground-nut oil and molasses, press the leaves into packs, cut them into squares, then into fine shreds. Another is to hang the leaves by their stems until they are dry, then roll them into cigars. There are two

kinds of pipes, one with a long stem and small bowl, the other a water pipe, in which the smoke is cooled and purified by being drawn through water. Cigars are smoked in the long pipes, being stuck into the small bowls before lighting (*ibid.*, p. 559).

At the close of the Manchu dynasty and in the first years of the Republic, there was some traffic in and use of opium, but it was planted in out-of-the-way places and sold and used secretly. In 1916 Gen. Ch'ai O, rebelling against Yuan Shih-k'ai, invaded Szechwan with an army of Yunnanese. This army and its officers brought much opium into Szechwan, which greatly stimulated opium planting and use in this province. Opium was planted openly and over a large area in the province, and the number of smokers increased at least several fold. After the National Government in Nanking, about 1930, secured a stronger hold in Szechwan, there was much less planting of opium in the province, and its use greatly diminished. In the large cities efforts were made to help addicts get rid of the habit.

Prior to 1930 the cultivation, transportation, sale, and smoking of opium was a very important factor in the economic life of West China. Farmers were heavily taxed for its cultivation. Before the time of planting, placards were often posted in towns and cities stating how much the tax would be. Sometimes a compulsory "lazy man's contribution" was collected from those who did not plant the poppy. This was so high that farmers were compelled to plant opium. The planting of opium decreased the food supply and raised the cost of living. Opium was also taxed during transportation, and to make sure of this source of income officials would take an interest in safe delivery, severely punishing robbers who stole the opium. Opium dens were taxed according to the number of lamps used in smoking the drug, and if a proprietor wished to close down, he was often required to find another person who would operate such a den with at least as many lamps for smoking. The opium was very expensive and was a heavy drain on the finances of smokers and their families, who often became bankrupt. The habit also unfitted many for useful and gainful occupations. Those who profited from the opium trade were the farmers who planted it, the merchants who bought and sold it, the proprietors of dens where it was smoked, and the officials who collected the taxes.

There were ethnic groups in West China, such as the Ch'uan Miao and the Ch'iang, among whom there were practically no merchants. The Chinese, however, have long been skillful merchants, and stores existed in every city and village for the sale of various items. Except

for a few holidays, these stores are almost always open for business, thus affording employment to a large number of people. In the smaller stores all the work is done by members of the family. Only in the largest stores are clerks, accountants, and servants hired. Certain days are set apart for special market days, on which many people come from far and near to sell their products—firewood, vegetables, grains, chickens, eggs, etc. Many others come to buy, so that on these days the markets and streets are crowded.

Farming is the main occupation in West China, about 85 percent of the people being employed in this way. As a consequence of good fertilizing and irrigation, the yield per acre is large, but owing to meager tools and lack of machinery, the yield per person is small.

Some wealthy people own large farms. Some of the owners farm the land themselves, hiring others to help them. Others rent their land to families who work it and give the owners a goodly share of the crop. Some families with small farms are able to do all the work themselves, while others find it necessary to hire help at planting and at harvest times. On some farms there are slack seasons when farmers and their sons hire out as trackers to pull and row boats, or as laborers to carry loads.

An important occupation is that of boatman or tracker. Hundreds of thousands are employed in this way. Another is the carrying of burdens, some using the carrying-pole with half the load suspended on each end, others carrying the loads on their backs, and still others using a large pole carried by two or more men, with the load suspended from the pole. Other occupations are the operating of the salt wells, coal mining, cutting down trees and making them into firewood or lumber, the white wax industry, the silk industry, spinning cotton into thread, weaving cloth, fishing, hunting, and working as servants in the homes of others. Many are employed as carpenters, blacksmiths, masons, stone masons, bricklayers, water carriers, and in many other occupations.

The clothing varies much among tribespeople of West China, many of them being distinguishable from other ethnic groups by their clothing. Tibetans often wear a long, thick red gown held at the waist by a belt. Lolo men often wear thick felt cloaks which can also be used as covers when sleeping. Many Ch'iang men and women wear undyed white hemp garments. Ch'uan Miao men dress like the Chinese, but the women, when they go to market and on dress-up occasions, wear embroidered dresses with short skirts.

At the beginning of the 20th century Chinese women wore trousers

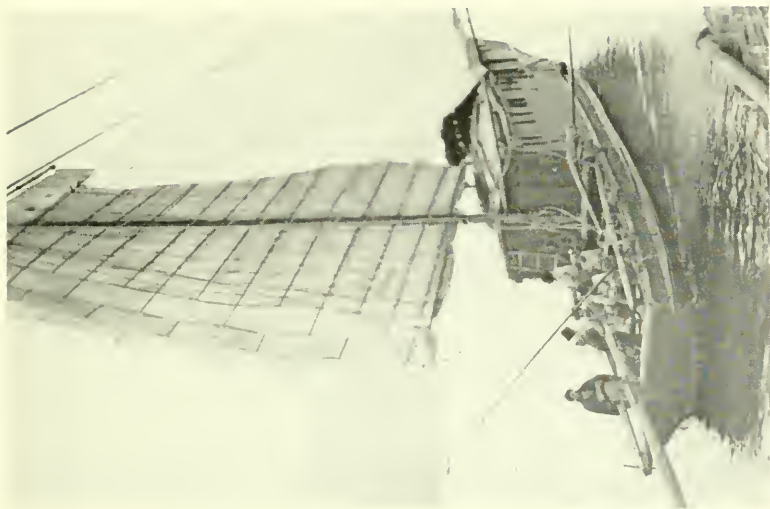
and most of them had bound feet. The men wore long gowns that resembled dresses with long skirts. Most of these and other clothing were made of blue cotton cloth. Women generally wore hats open at the top and nicely embroidered, and men wore skullcaps. Both men and women often wore blue or white cotton cloth wrapped around their heads. Laborers and farmers generally wore straw sandals, and both men and women sometimes wore cotton shoes with thick soles. During the Manchu dynasty men and women of official rank wore, on festive occasions, beautifully embroidered mandarin gowns, beads around their necks, finger rings and wristlets, and elaborately ornamented hats, most of these items being discarded after the establishment of the Republic.

Tools and implements vary with the different occupations, and only a few will be mentioned here. Many tools are crude and simple, most of them being made by hand. Yet some Chinese artisans work wonders with their tools.

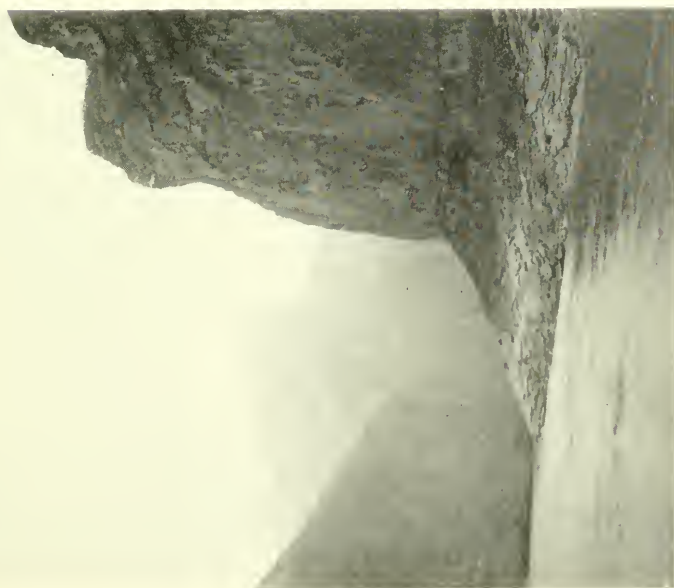
The plow consists of part of a tree crooked or curved on the large end, and above the plowshare a stick attached for a handle. At lower altitudes, especially in rice paddies, a plow is generally drawn by a water buffalo, and at higher altitudes, especially on dry ground, by a cow, a horse, or a mule. A short, wooden-handled iron sickle is used to cut grass to feed the domestic animals, to cut bushes, limbs, and small trees for fuel, and to reap the crops. The hoe has a long wooden handle and a long, thick blade. Where land is too steep to use the plow, the only way to put it under cultivation is to use the hoe. Harrows are made by driving large iron spikes through large pieces of wood fastened together at right angles. The fields are sometimes harrowed in order to level the soil and break up the clods.

Carpenters use saws of different sizes, some operated by one man and some by two. They also use hammers, hatchets, planes, and chisels. Stone masons use hammers, sledges, and chisels, while other masons use the trowel, the plummet, shovels, and hoes.

Many of the houses of the poorer people have walls of pounded clay or of bamboo strips woven together, plastered over with clay, and then whitewashed. Some of the poorest people make the walls of their houses of cornstalks, while the walls of the best houses are made of wood or brick. Houses of the poorer people have thatched roofs, while those of the well-to-do are roofed with tile. On the China-Tibetan border, many houses are built of stone, with flat roofs. Others have sloping roofs covered with long shingles, each shingle held in place by a large stone.



2. A houseboat on the Yangtse River, West China.



1. View in the Yangtse gorges above Ichang.



1. A Chinese cargo boat ascending a strong rapid in the Yangtse gorges, West China.



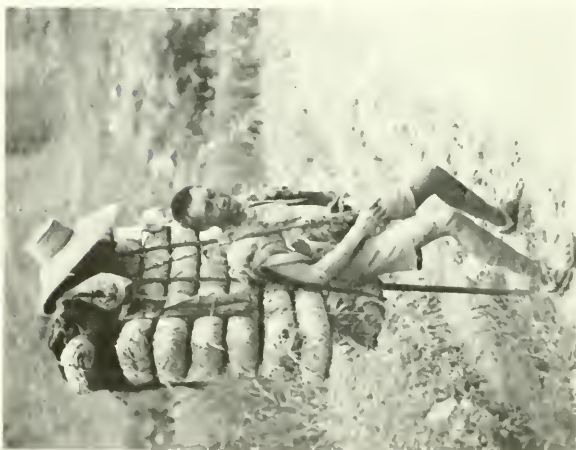
2. View of Chungking from the Yangtse River. On the shore are Chinese wooden boats; higher up, Chinese houses on high wooden posts to keep them above the river in high water; and still higher are temples and other buildings of Chungking.



1. A typical bamboo cable or "rope" bridge at Kuanhsien. Similar bridges are found at So-ch'iao, Wen-ch'uan, Li-fan, Wei-chon, and Mou-chow in western Szechwan.



2. The Chinese town of Mu-p'ing, in the highlands of Sikang, typical of thousands of Chinese towns and villages before the streets were widened. The houses and stores have tile roofs.



1. A Chinese carrying tea from Ya-an to Tatsienlu for use in Tibet. Some Chinese have been known to carry 400 pounds in one load.



2. A motor road on a steep hillside between Yunnan and Chungking, with 24 hairpin turns.

The houses of the poor are often oblong in shape, with only one, two, or three rooms. Large families often build their houses with four wings joining to make a square, with an open space in the center called a "sky well," from which doors open into all surrounding rooms.

During the lifetime of a parent, all his descendants, excepting married daughters and their families, live in the same house, and the incomes of all are pooled. Each member of the family shares the benefits of those whose incomes are large, and those with small incomes or none at all have food, clothing, and a house to live in.

Floods and droughts have caused a great deal of suffering in China. In "China: Land of Famine," by Walter Mallory, the author presents a table showing the number of known floods in China in a thousand years, and two others showing the number of droughts. By far the greatest number of disastrous droughts and floods have occurred in northeastern and central China. According to one chart, the greatest number of droughts in West China occurred in Shensi (91), the next greatest in Szechwan (35), and the fewest in Yunnan (19), Kansu (4), and Kweichow (4) (Mallory, 1926, pp. 41-43). Failure of crops for one year, or even for part of a year, causes much distress and sometimes many deaths. During famines the price of foods becomes very high, so that starvation or semistarvation occurs among the poor people. Floods have been very rare in Szechwan, Sikang, Kweichow, and Yunnan, more common in Kansu, and most common in Shensi. They are caused by monsoon rains, never by the melting snows in Tibet.

Centuries ago Szechwan was famous for the peppers it shipped to Canton, and walkingsticks were exported to India. Han dynasty lacquer from Chengtu has been found in Korea. In recent years mandarin oranges have been shipped from I-pin to Chengtu, and tight-skinned oranges from the region of Chengtu down the Min and the Yangtse Rivers. Salt has been mined in Wu-t'ung-ch'iao and Tzu-liuching and shipped all over the province, to Sikang, to northern Yunnan, and down the Yangtse River. Coal is shipped up and down the rivers and streams, and overland to near and distant places. From the mountains of Sikang and western Szechwan, rafts of logs are shipped down the rivers to East China. Silk, *t'ung* oil, pigs' bristles, medicines, and other commodities are shipped to East China and to foreign countries.

The imports into West China are many, some coming overland, but most of them by river. Among these have been seafood, kerosene, tobacco, cotton and cotton cloth, iron, copper, and a great variety of manufactured goods.

In West China there were two post offices in 1901, many more being established in subsequent years. S. C. Yang, who helped establish many post offices in West China, arrived in Chengtu late in 1901 and reported that he found there no traces of modern technology or modern conveniences. There were only three government schools in the city, and a few mission schools. There were no telephones, electric lights, newspapers, motor roads, or modern factories (Yang, S. C., 1932, pp. 7-11). Apparently there were no jinrickshas.

Between 1900 and 1948 there were many important changes in China that affected the economic life of the people. Most of the changes began in the treaty ports and spread westward, slowly at first, but with increasing rapidity. All the main railroads were built after 1900. Chambers of Commerce were established and improved in quality. Modern banks were opened, becoming important factors in the Chinese economy. Steamships traveled up the Yangtse River. City streets were widened and paved, motor roads built, and jinrickshas, carts, automobiles, trucks, and busses appeared. In time airports were built, and airplanes used. The telegraph, the telephone, and the electric light gradually came into common use. As early as 1921 modern factories in China included arsenals, canneries, breweries, dockyards, shipbuilding plants, flour mills, and factories for the manufacture of cement, confectionaries, chemicals, furniture, glass, iron and steel, lace and hairnets, leather, matches, nails and needles, ropes, silk, soap and candles, sugar, tea, tobacco, and tools (Stauffer, 1922, p. 25; Smith, 1916, pp. 1-10; Tchou, 1923, pp. 15-20).

As regards West China, as late as 1921 there were no railroads in Kokonor, Kansu, Shensi, Sikang, Szechwan, or Kweichow. Throughout West China the city streets were very narrow and there were no motor roads, although a survey was being made for one from Chungking to Chengtu. The largest roads were about 5 feet wide. There were no automobiles or airplanes, and few cities had jinrickshas or electric lights. There were very few modern factories. Then came motor roads, widened and paved city streets, automobiles, trucks and interurban busses, electric lights, telephones, radios, factories of all kinds, modern clothing and utensils, modern stores, and many modern inventions that greatly affected the economic and social life of the people.

It should be emphasized that practically every phase of the economic life of the people of West China has been intimately related with religion. Charms, religious ceremonies, priests and shamans, and the gods were relied on to give success in the task of solving the economic problems of individuals, families, and communities.

SOCIAL LIFE AND CUSTOMS

THE FAMILY AND FILIAL PIETY

China is in the Temperate Zone. The climate is generally good, and the soil productive. There are occasional droughts, floods, and pestilences, but on the whole life is pleasant. This may explain at least in part why the Chinese are optimistic, regard life as worth living, and place the highest value on life in this world.

The nature of their language, their history, their customs, and their literature indicates that for several thousands of years the Chinese have been an agricultural people. This facilitated the growth of family life, the organization of families into clans or tribes, and finally into a great nation. The Chinese were primarily interested in the social order, the present world in and of itself being regarded as of supreme value. While they believe in life after death, life in this world is regarded as better, more pleasant, and more important.

The family is the starting point of all interests, the rights of individuals being subordinated to those of the family group. Property belongs to the family, not to the individual members of the family, and the incomes of all are pooled. The family means so much that an isolated individual feels peculiarly alone. Kulp has called this aspect of Chinese life familism.

Filial piety is held in high esteem, its roots extending back to the very beginnings of Chinese history. The power of the family is focused in its head, and filial piety is the organizing principle that holds the family together. Reverence and obedience to the parents is the first duty of the children. These principles vitally affect the social and religious worlds of the Chinese. Religion is a family and a community affair, and ethics is social.

Filial piety is the cardinal virtue. One of the worst things that can be said of a person, if not the worst, is that he is unfilial. About the worst thing a person can do is to die without leaving descendants to continue the family and to carry on its ceremonies of venerating and commemorating the deceased ancestors. Filial piety requires that a person show respect and love for his parents and elders, and for his ancestors for three generations. For millennia this has been the cement that has strengthened and bound Chinese society together. Some of the results were elaborate funeral ceremonies, expensive tombs, and ceremonies of commemoration and veneration.

All this is affected by the dualistic *yin-yang* conception. The *yin* is the female principle and is lower, weaker, and inferior to the *yang* principle, which is male and is superior, stronger, and better than the

yin. The happiness and welfare of society depends on keeping the female principle under control of the *yang*. The husband is the master, and it is the duty of a woman to obey her father, her father-in-law, and her husband. After the death of her husband, she must obey her oldest son.

The pattern of the family is carried over into the political organization. The sovereign is the parent of the people, and there is mutual dependence as between parents and children. Local leaders are the connecting links between the rulers and their subjects. The emperor is appointed by Heaven, but his tenure of office depends on the will of the people. His conduct should be exemplary, for his subjects will follow his example, and his good conduct will bring prosperity to all. It is the duty of subjects to render perfect and respectful obedience.

Most of the property belongs to the family and not to the individual. Marriages are family affairs, arranged by representatives of the two families. The consent of the two young people is not necessary, and often they do not see or meet each other until their marriage. After marriage the young couple live in the same home as the parents, grandparents, brothers, and unmarried sisters of the groom, and with the wives and children. The wife then practically ceases to be a member of the family into which she was born, and becomes a member of her husband's family. Property is inherited only by sons, and a family is divided into new families after the death of the parents.

In each family the oldest male is the ruler, and the other members of the family are under obligation to obey him. He in turn is responsible to the government and to society for the conduct of the members of his family. While under obligation to obey, wives often in direct and indirect ways exert much influence over their husbands.

Much that has been described in the last paragraphs had been changed by law and social practice, or was in the process of change, by 1948. While the ideal was for a family to remain together in the same home for several generations—sometimes as many as five, poverty and the lack of property often made it necessary for a family to divide and to form new families in new homes.

An essential element of filial piety is respect for the aged. Age and gray hairs bring high honors and good treatment, and, in the best families, love and kindness. Younger brothers are respectful and obedient to older brothers, and young women to older women.

As we have said before, the Chinese are socially minded, and their ethics are social ethics. What is considered good or bad depends much on what will be helpful or injurious to human beings and especially to the family.

AMUSEMENTS

The Chinese are very human and, like human beings throughout the world, desire and enjoy play, amusement, and recreation. This desire finds satisfaction in many ways.

Chinese children have many games. One is blind man's buff, resembling in some ways the same game as played by Western people. Another is "snake protecting her eggs." One player supports himself on his hands and his toes. Under him are placed several stones, supposed to be snakes' eggs. The other players try to steal the eggs, and the one protecting the eggs tries to kick the legs of the players who are trying to steal the eggs.

Another game formerly played is pitching coins against a wall. Each player pitches his coin against the wall, making it bounce back as far as possible. The one whose coin goes the farthest picks it up and tries to hit the nearest coin with it. If he succeeds, both coins are his. If he does not, the person whose coin is next farthest picks it up and tries to hit the coin nearest to his. If he fails, the third one takes his turn, and so on.

One game enjoyed by both boys and girls and sometimes by grown people, is a variation of our battledore and is called by some Westerners in China "kicking the shuttlecock." A brass or a copper coin is wrapped in fish skin, and to this is attached several chicken feathers. When the shuttlecock is kicked up in the air, the coin will come down first. The game is generally for one person to kick the shuttlecock as many times as possible without letting it fall to the ground.

Two games enjoyed by people of all ages are cards and mah jong. Many become very skillful at these games, which are generally associated with gambling.

Holidays are often spent as days of recreation and amusement. This is especially true of the first five days of the new year. Boys go about blowing horns and gangs of boys walk through the streets beating drums and blowing bugles. Groups of men and women stand in the streets or sit in their homes playing cards, mah jong, and other chance games, almost all of which are accompanied by gambling.

The great festivals celebrating the birthdays of the gods are occasions for meeting friends, drinking tea or wine, talking, and sometimes dining together. There is amusement also in watching the great parades, which are parts of these festivals. Generally these are followed by theatricals in the temples, and by a feast to which loyal supporters of the temple and its worship are invited. The boat races at the

dragon-boat festival furnish entertainment for thousands and sometimes tens of thousands of people. The Autumn Festival is a day when people go out on the hills, enjoy the scenery, and sometimes write poetry.

An important kind of entertainment is the theatricals. Until more recent years, only men were actors, and some of them became very clever in acting the parts of women and girls. The plays generally portray events in the past history of China, so that in addition to providing amusement, the plays also have an educational value. Herbert A. Giles (1911, p. 160) called the theater the national recreation of China.

Chinese men and boys show a great deal of skill in the making and flying of kites, which are sometimes flown to great heights.

At feasts two guests often play "guess-fingers." Each will display at the same time several fingers on one hand. At the same instant each will try to guess the total number of fingers displayed. If one guesses right and the other does not, the one who fails has to drink a cup of wine. The game is sometimes continued until one or both the players are drunk.

Two very common forms of social entertainment and amusement in West China are feasts and tea drinking. The Chinese make a delightful variety of tasty foods, and thoroughly enjoy them. There are feasts at New Year time, at Ch'ing Ming, on important birthdays, at funerals and weddings, and at many other times. The guests wear their best clothing, and invariably reciprocate by inviting their hosts to a feast at some later date.

Tea drinking is sanitary, for the water is purified by boiling. In the homes tea is generally preferred to water. When guests come to visit, they are always given tea to drink, and at feasts or parties, each guest has his cup of tea. Every city, town, or village has its tea shops where guests, for a small sum, can sit around a table as long as they wish, talking and sipping tea. Often business affairs and even quarrels are settled over the teacups in the tea shops.

In recent years the Chinese have adopted many foreign games and amusements. To mention only a few, there are poker, association football, track athletics, tennis, basketball, volley ball, and moving pictures.

SOME SPECIAL SOCIAL CUSTOMS

There are four things about the social life of the Chinese that deserve special mention. First, the Chinese have a good sense of humor and enjoy laughing at a good, friendly joke. It causes all who are

present to be in a good humor and to like the person who tells the joke and causes them to laugh. For this reason I told many more jokes among the Chinese than I do among Occidentals.

Second, the Chinese are a very polite people. In the course of their long history they have developed many forms of decorum that it behooves the foreigner to know about. At a feast and on similar occasions the guest is always offered the seat of honor. It is good form for him to decline this invitation, at least for a short time, saying "*pu kan tang*," or "I am unworthy." When the guest leaves, the host escorts him to the door or to the gate saying "go slowly, go slowly," and the guest replies, "*pu sung*," or "do not escort me out." When a friend informs you that he is coming to your home to visit you, he will say that he is coming to "*pai wang*" or to look at you very respectfully, meaning to visit you. If he invites you to visit him, he will request you to come to his unworthy dwelling to play or to have a little chat.

A third important characteristic of the Chinese is gratitude. Giles has noted this and stated that gratitude is a virtue which the Chinese possess to an eminent degree, and that a Chinese never forgets a kind act or loses a sense of obligation and gratitude to his benefactor. I have had many experiences that verify these statements. Sometimes one will do a Chinese a small favor and forget about it. Later the Chinese may do him a big favor in return.

Closely related to these characteristics is a fourth—the fact that the Chinese respond favorably to and reciprocate friendship, kindness, and humane behavior. If they are convinced that you respect them, appreciate them, see good in them, and have a friendly regard for them, they respond in kind. Here again I speak from experience, for many of my best friends have been Chinese.

In 1894 Dr. Arthur H. Smith published a book, "Chinese Characteristics." In it are chapters dealing with face, economy, industry, politeness, the disregard of time, the disregard of accuracy, the talent of misunderstanding, the talent for indirection, flexile inflexibility, intellectual turbidity, the absence of nerves, contempt for foreigners, the absence of public spirit, conservatism, indifference to comfort and convenience, physical vitality, patience and perseverance, contentment and cheerfulness, filial piety, benevolence, the absence of sympathy, social typhoons, mutual responsibility and respect for law, mutual suspicion, the absence of sincerity, polytheism, pantheism, atheism. One can now see that in some of his interpretations Dr. Smith was right, while in other important respects he partially or completely misunderstood the Chinese people.

BIRTH, ENGAGEMENT, MARRIAGE, DEATH, AND BURIAL

For most people, irrespective of race, nationality, or religion, the outstanding events of their lives are birth, marriage, and death. It is to be expected, therefore, that many religious rites and ceremonies are bound up with these and related events. Although there are many resemblances in these customs as they appear in various parts of China, there are also many differences. The same is true also of the different localities in West China. There are both resemblances and differences.

The social and religious customs in West China are apparently a blend of the Chinese culture with the cultures of other nations and ethnic groups—India, Tibet, the Miao, the Lolos, the Ch'iang, the Shan or Tai, and others. It cannot always be determined which borrowed from the other, but the main and strongest influence has been Chinese.

A very strong and almost universal desire among the Chinese people is for a numerous posterity. Though daughters are generally welcomed, the desire for sons predominates. When a daughter is born, it is called a *hsiao hsi*, or a little joy, but when a son is born, it is called a *ta hsi*, or a great joy. The reasons for this and the methods used to obtain sons will be described later.

A woman's prestige in her family and in society is much greater after she has given birth to a son. Failure to give birth to sons is sometimes, though rarely, a reason for divorce. More often it results in her husband's taking a concubine, who is called a little or lesser wife. But if the concubine gives birth to one or more sons and the principal wife does not, the prestige and position of the concubine in the family may become greater than that of the principal wife. Of course there are jealousies and rivalries for the affection and attention of the husband.

In China to be unfilial is one of the worst of sins. There are several ways to be unfilial, but the worst of all is not to have sons to continue the family line and to continue to perform the ceremonies of venerating and commemorating the ancestors.

It has been affirmed by some and denied by others that infanticide has been practiced in China. There is probably no better authority than Olga Lang. She asserts that it has long been practiced in China, mostly, if not exclusively, with girls, and that she found evidence of it during her fieldwork in China in 1935 to 1937. Sometimes it is accomplished through poor food, poor care, and ill treatment (Lang, 1946, pp. 46-47, 150, 151, 152, 253, 332).

When a child is born, the wife's mother pays a visit, bringing a present of chickens, eggs, and other edibles (Grainger, 1921, p. 5). A sorcerer, or *tuan kung*, is called to exorcise demons (ibid.), for at this time demons are believed to be hovering about in the hope of causing the death of the mother or the child. A midwife is called in. Should the birth be delayed or attended with difficulty, firecrackers or guns are set off to frighten the demons (ibid.). The Chui-shen-niang-niang may be worshiped in the hope of obtaining a speedy and easy delivery.

While the birth is taking place, an umbrella is hung above the mother as she lies in bed. If it is made of paper and *t'ung* (wood) oil, it is believed to be more efficacious, for demons fear *t'ung* oil. For this reason several *t'ung* oil lamps, or bowls filled with *t'ung* oil, are placed on the floor near the bed and lighted to keep the demons away.

After the child is born, the father goes to the homes of friends and relatives and gives them a few red-colored eggs, and announces the birth of the child. In return the relatives and friends, during the first month, give presents of food, clothing, playthings, and ornaments.

Usually at the end of three days the baby is given a bath, but sometimes this is delayed many days. About this time the wife's mother makes a second visit, bringing gifts of food, clothing, or other things.

After the birth of a child the mother is supposed to be unclean and ill-omened or dangerous. She is therefore confined to her room for at least 30 days. If she comes out before the allotted time, some calamity will befall the family. At the end of a month there is a feast, to which friends and relatives are invited, including all who have given presents after the birth of the child.

After 30 days a barber is called to shave the baby's head. It is believed that the baby's hair is so wiry that the barber's razor cannot be used again. The barber therefore uses an old razor which often injures the head of the child. The barber is remunerated about twice the normal charge.

At the end of one year friends and relatives again bring presents of food, clothing, playthings, or ornaments, and again they are invited to a feast. The child is seated on the floor, and around him are placed a book, pencils, money, and other objects. Whatever object a son picks up indicates what his future interest will be. If he grasps a book or a pencil, he will be a scholar. If he grasps money, he will probably be a businessman and wealthy.

A common belief is expressed in the Classic of the Bloody Basin, which is a Buddhist sacred book. At childbirth the mother sheds blood, which gets onto her clothes and into the water. This defiles the

water in pools and streams, which later is offered to the gods and greatly offends them. As a consequence every woman, but no man, suffers torments of hell in the bloody basin. She is ordered by the god to drink this blood, but being unable to do so, she is beaten unmercifully with a club. The only remedy for her predicament is to invite a Buddhist or a Taoist priest to chant ceremonially the Classic of the Bloody Basin and pray for her release (Graham, 1928b, pp. 18-22).

In the old China engagements were not made by the young man and the young woman concerned; they were family affairs, arranged by the parents of the two families through go-betweens. Sometimes the engagements were made when the two children were very young. In this society, all women got married, but in some of the poorest families only the oldest son got married, with the consequence that one or more of the sons had no wife. The unmarried sons, however, were expected to help support the families of their parents.

When the parents decided that it was time for their son to become engaged, they invited a go-between. Before the latter approached a family having a marriageable daughter, the boy's parents resorted to divination to ascertain whether the arrangement was likely to be auspicious. If the answer was favorable, the go-between was sent to the family of the maiden, taking with him presents for her parents. If the girl's parents were favorable, they gave the girl's horoscope to the go-between, who took it to the parents of the boy. Again the boy's parents resorted to divination, and if the results were again favorable they consulted an expert on horoscopes. If the horoscopes indicated that the marriage would be fortunate, the engagement was consummated. More presents and sometimes money were given to the girl's parents.

Engagements were very binding and were almost never broken. If it should happen that the family of the young woman broke the engagement, it was almost impossible for her to get married to anyone else, for the prospective husband would fear the hatred, jealousy, and vengeance of the young man to whom she had been engaged. The writer knew of a girl who broke an engagement because the young man had participated in gambling and other immoral practices. For years no one proposed marriage to her, although she was educated, talented, and good looking. She finally became pregnant without marriage to a wealthy young man, whom she compelled to marry her by threatening to kill herself on his doorstep.

Until recently the consent of the two young people to the marriage

was not asked by the parents, nor were they consulted. They were not permitted to meet or to get acquainted until they came together at the marriage ceremony. Here they often met and saw each other for the first time.

When the parents of the groom have decided that the time when the young couple should get married is approaching, generally between the ages of 16 and 20, they informally consult the parents of the bride, and a day for the ceremony is chosen. It must be a lucky day and at a lucky hour. The date of the wedding is then formally announced (Grainger, 1921, p. 10). The go-between, taking with him edibles and clothing and other presents for the bride, calls on the bride's parents and breaks the news. Relatives of the bride also assemble in her home, and bring presents for her. Then her parents provide a feast for all the guests, including the go-between (*ibid.*).

A few days before the wedding the family of the groom sends red invitation cards in red envelopes to all the friends and relatives, inviting them to be present and informing them of the date of the wedding ceremony. Some of the invited guests arrive at the groom's home on the afternoon or evening before the wedding and stay all night. Others arrive on the wedding day. Virtually all the guests send or bring presents—food, clothing, money, real or tinsel flowers, pairs of scrolls, and other things. They amuse themselves by chatting, playing cards, gambling, and drinking tea and wine.

For two or three days before the wedding, the bride is expected to be very sad, weeping occasionally to show sorrow at leaving her parents. Her parents prepare for her gifts of bedding, furniture, bed curtains, and other things (*ibid.*, p. 11).

On the day of the wedding, the go-between leads a procession to the home of the bride. In the procession are banners, umbrellas or canopies, trays full of presents, musicians playing horns, beating brass timbrels and drums, and playing flutes, and men carrying the bridal chair. Friends of the groom's parents accompany the go-between, and the musicians play wedding music both on the way to and from the home of the bride (*ibid.*, p. 11).

The bride comes into the guest room of her parents. Facing the outer door, she throws a pair of chopsticks over her shoulder to signify that she will no longer eat the food of her parents. Then she bows to the tablets of her ancestors, to the house gods, then to her parents. She is then dressed in a special gown, and a red veil is put on. Then she is either led to the wedding chair by a sister-in-law, or is carried there on the back of a brother. Her mother takes a light

and looks into the corners of the wedding chair, lest demons be hiding there. Then the bride enters the chair, and the doors and windows are closed. All this time and during the first part of the procession to the groom's home the bride continues to weep, but stops crying before reaching her new home, lest she seem to be unwilling to come.

The deep-red wedding chair, called a *hua-chiao* or flowery sedan chair, with some other paraphernalia used in the procession, is rented from a chair shop and carried by poles on the shoulders of men. On the back of the chair are one or two lighted lanterns to keep away demons, and often for the same purpose a bronze or brass mirror, or an almanac, is hung behind or in front.

On the way to her new home the bride is accompanied by her brothers and a few other relatives. Firecrackers are set off as the procession starts, and there is music all the way. On arrival at the door of the groom's home, a chicken is killed and the blood is sprinkled around the bridal chair as an additional precaution against demons. Firecrackers are set off, and the chair is carried inside the house (*ibid.*, p. 13).

The door of the bridal chair is opened, and the bride is led into the hall to the side of the groom, who is waiting for her. First the bride and the groom face the front door and bow in reverence to Heaven and Earth, then to the household gods and the deceased ancestors, then to friends and relatives, and finally to each other (*ibid.*).

According to one old custom the bride and the groom are then led to the bridal chamber, where they sit on the edge of the bed a short time and are given two cups of tea and two cups of soup. The groom sips a little from both cups, but the bride abstains. Then the wedding curtains are hung up, some jujubes and dragons' eyes are scattered around the room, and the bridegroom and the male relatives leave the room while the bride is attired in her wedding clothes. Then the bride and the groom come forth, respectfully bow to the ancestors and to the parents, and receive the congratulations of relatives and friends (*ibid.*, p. 14). The father of the groom congratulates them, reminds them of the many benefits received from their parents in the past, and urges them to live in harmony and to continue to be filial to their parents (*ibid.*). Then comes the wedding feast, after which the guests begin to depart. Later, young people are likely to enter the bridal chamber and engage in banter and horseplay.

A few days after this the bride and the groom pay a visit to the bride's home, where they are feasted, but they return to their home on the same day. Later they pay another visit and the groom leaves

the bride with her parents a few days, after which he goes and brings her back to her new home (*ibid.*). There are many variations in these customs.

If the girl dies after engagement and before marriage, it is the duty of the young man to marry another woman. If she dies after marriage, it is his duty to remarry. This is so that he can fulfill his obligation to rear sons who will continue the family line and leave descendants who will carry on the ceremonies of ancestral worship. If the young man dies before marriage, very often the woman will remain unmarried in order to join him in the after life. If he dies after marriage, it is the duty of the woman to remain an unmarried widow and to join him as his wife in the spirit world. In Chengtu I saw the grave of an aviator who was killed during World War II. His betrothed killed herself and was buried with him in the same grave, an act which was highly commended by many Chinese. Years earlier a man living in I-pin was drowned. His wife tried to kill herself by taking opium so as to accompany him as his wife in the world of spirits.

Before the coming of modern medicine, the death rate in West China was very high. The writer has made inquiries among the Ch'iang and among the Chinese as to how many children were born in a family and how many were still living. A fair average was 11 to 13 born, and 2 to 4 still living.

There is a serious lack of knowledge of sanitation, and the germ theory is not understood. Spitting on floors and on the streets is very common. In surgery, except in modern hospitals, the knives, forceps, and scissors are not sterilized, so that infections are frequent and often fatal. People often die from simple infections or from boils. Epidemics spread from community to community, causing deaths by the thousands, hundreds of thousands, and sometimes millions. Except for smallpox, vaccine is not understood and used. All diseases are thought to be the work of demons.

The theory of medicine and sickness is based on the *yin-yang* philosophy. The human body is believed to be composed of the two elements, *yin* and *yang*. *Yang* is warm, and *yin* is cold. Normally the two elements are equal and balanced in the body, and the temperature is normal. If there is too much of the *yang* and too little of the *yin*, the person becomes ill and has a fever, or at least a high temperature. If there is too much of the *yin* and too little of the *yang*, the temperature of the body is low, and the person has chills. Medicines are also divided into *yin* and *yang*; this includes large numbers of

herbs, and also parts of living creatures, including bones of leopards and tigers.

If a person has a *yang* sickness, there is too much of the *yang* in his body and too little of the *yin*, and he must take *yin* medicine to bring about a balance. Large doses of medicine are sometimes advised. If a person has a *yin* sickness, he must take *yang* medicine to restore the balance. It is not surprising that in some cases the medicine kills the patient.

The *yin-yang* postulate may seem inconsistent with the theory that diseases and other calamities are caused by demons, but both theories are held. Consequently, resort to the exorcism of demons is also a very common practice. A *tuan kung*, or sorcerer, and a Buddhist or Taoist priest are supposed to be about equally efficient in exorcising demons. They use charms, incantations, and chant their sacred books.

Occasionally a patient, or one or more of his relatives, will go to a temple, worship the deity, pray for healing, and make a promise or vow. Sometimes the vow relates to giving the god or goddess a new coat of paint, called new clothing. Sometimes it entails the repair of part or all of the temple, or the making of a gift to the god, the priest, or the temple, such as a chicken, a pig, or spirit cash or actual money. If the person recovers, the promise is fulfilled.

An example of a practice that is often disastrous is the cutting of the umbilical cord after the birth of a child with an unsterilized knife or pair of scissors. The cutting instrument is sometimes washed in cow manure. The result, of course, is the death of many new-born babies a few days after birth. The special name for this disease is *ch'i l'ien feng*, or seven-day malady.

Acupuncture is practiced in West China. The practitioner drives a large, unsterilized metal needle deep into the flesh several times in several places, often to the bone. The operation is painful, and a fatal infection may follow.

Sometimes a sick person becomes convinced that he is about to die and stops eating and drinking properly, so that death does actually ensue. A Christian friend, Mr. Ho Yu-i, believing that his end was near, called his wife and children to his side, and made a farewell talk admonishing them to be good and highly commending Christianity. Soon afterward he died. His son informed me that it was very impressive. During my stay in I-pin, I went to Chi-t'ien-pa and there called on Mrs. Chang, a widow who was a church member. She was ill and in bed, her daughter was sitting beside her, and in her room was her coffin. Mrs. Chang informed me that she was about to die,

and for that reason her coffin had been prepared. On inquiry, I was told that her main trouble was that she was not eating or drinking. Doubting that she had any fatal disease, I suggested that if she would eat food and drink tea or water she would probably get well. I gave her several cans of milk, recommending that she drink it gradually, eat some boiled rice, and later add other food. The last news I had of Mrs. Chang was that she was alive and well.

An old man or woman who expects to die soon may put on his or her best clothing and sit in a chair, awaiting the end. This is believed to be a more dignified way to die than lying in bed (*ibid.*, p. 19).

Coffins and grave clothes are often prepared for old people by their descendants long before they die. This pleases the old people, for then they can be sure that they have a good coffin and good clothing when they are buried.

Soon after a person dies, the body is bathed and dressed in the best clothes. Generally there are several layers of clothes, in some cases as many as 9 or 11. It must be an odd number, because an even number is unlucky. There must be no metal of any kind in the coffin, lest it drag the soul downward and prevent its upward flight after death (*ibid.*, pp. 18-19).

When the deceased is encoffined (usually on the day of his death), an old custom is to place a willow stick in his right hand and a loaf of bread in his left to keep off the spirit dogs. If the bread is insufficient or ineffective, the stick can be used (*ibid.*).

Soon after death, firecrackers are set off to frighten away demons, and spirit money is burned to be used as travel money by the deceased on the way to Hades. On at least some of the packages of spirit money that are burned, are written the name of the deceased, the date and place of his birth, how long and where he has lived, and the date and place of his death. There is also a request that at the barriers the deceased be allowed to pass. A road guide is provided to be used by the soul of the deceased in finding his way to Hades.

The coffin is placed in the parlor or guest room. If the deceased is an official, or one of his sons has official rank, the coffin is painted red. Otherwise it is painted black. A paper spirit tablet and a streamer are generally placed on a table near the coffin. During every meal, food and sometimes wine are offered to the deceased.

A Buddhist or Taoist priest or a *tuan kung* is invited to come and close the coffin. First the lid is taken off so that everybody can see the corpse. At this time there is much weeping and wailing. The coffin is searched to make sure that enemies have not thrown in any

small pieces of iron, for these would be very injurious to the descendants of the deceased. The coffin is then ceremonially closed and sealed with cement, after which it is never opened.

Coffins with thick walls are preferred, for then decay will occur more slowly. Very poor people have coffins made of boards about an inch thick, whereas wealthy people have coffins so thick that in the funeral procession it takes many men to carry them.

Buddhist and Taoist priests are called to perform the ceremony of opening the way of the soul to Hades. During this ceremony firecrackers are set off, sacred books are chanted, and the gods are worshiped.

A few days after death a ceremony is performed called *tso-tao-ch'ang*. It is supposed to be performed 7 days, but actually varies in length from 2 to 20 days. The sacred books are chanted, accompanied by the music of timbrels, and the soul of the deceased is enticed into the spirit tablet, which is thereafter its permanent home.

Before the funeral, many friends and relatives send gifts to the family. These gifts include, among other things, food, money, spirit cash or paper, firecrackers, and pairs of scrolls on which are written statements and sentiments complimentary to the deceased. In return, the givers are invited to the funeral feast, which is generally a big and sumptuous occasion.

An auspicious spot must be chosen for the grave. It has to be a place where the *fengshui* is good, and generally a *tuan kung* or a *fengshui* professor chooses the site. If the *fengshui* of the burial site is good, the descendants will prosper, but if not, they will have bad luck and suffer calamities.

Penuriousness and economy in expenditures for funerals, coffins, and tombs are looked upon as being unfilial and displeasing to the ancestors. Many families therefore spend beyond their means for these items, incurring debts which handicap them for many years.

The funeral procession is generally very impressive. Many relatives and friends march in the parade, as well as the musicians who play the funeral music, and Buddhist and Taoist priests. A live cock is perched on the coffin to keep away demons, for demons are afraid of roosters. If a son is an official or a military officer, a group of soldiers with guns may be included in the procession to add dignity and numbers. The oldest son, dressed in sackcloth, walks ahead of the coffin supported by two friends and using a cane. Firecrackers are set off at the beginning and at the end of the procession, and spirit money is burned.

I witnessed and marched as a sympathetic mourner in the funeral of Mrs. Lei (thunder), and the following are the notes I took on this occasion.

This funeral took place at I-pin, Szechwan Province, China, December 4, 1928. I was a friend of the oldest son and chief mourner, Captain Lei, of the Lei clan or family, the most powerful in I-pin, so I was invited to attend. It was agreed that instead of the kowtow, I could show my sympathy and respect in ways that were agreeable to me.

There was a great funeral parade through some of the main streets of the city to the river. The principal mourners and helpers and the Taoist priest crossed in ferryboats to the opposite side of the river, where the burial ceremonies took place. This parade was half a mile long.

The home of Mr. Lei, the most powerful permanent resident of the city, was outside the west gate in the western suburb. All the guests, the friends and the mourners, including myself, wore white cotton cloths wrapped around their hats as a sign of mourning. The deceased was the mother of Mr. Lei. At the home, the guests and relatives all bowed and kowtowed in respect or worship to the spirit tablet of the deceased. Her soul or spirit was believed to be in this tablet. I tipped my hat and bowed to show my respect and sympathy. Many friends and guests had given as presents paper scrolls on which there had been written expressions of sympathy and compliments to Mrs. Lei and her family. In return they were invited to the feast and to the funeral.

First in the parade the scrolls were carried. These had been given in pairs, the second scroll completing the meaning of the first. There was a long line of men and boys carrying these scrolls. Next there marched about a thousand soldiers carrying rifles. About 30 policemen followed the soldiers. Then pavilions were carried, large and small, on which were attractive ornamental things such as vases and stuffed birds. Then came some mourners, then the coffin. Behind the coffin were other mourners. The sons followed the coffin dressed in sack-cloth, a dull white in color, and wearing white hats made of paper. The sons all walked. The oldest son was led or half led and half carried by two men, one on each side. He also held a cane or staff in his hands, using it to support himself and conveying the impression that he was completely crushed by the loss of his mother. I marched in the parade with the guests.

The river was crossed in boats, and the main parade ended at the river.

At the grave, paper or spirit money was burned in the grave pit, which was nearly 2 feet deep. The ashes of the spirit money were left temporarily strewn out in the pit. First the chief mourner bowed or kowtowed to his deceased ancestor in front of the grave. The coffin, painted red because the chief mourner, the oldest son Mr. Lei, was a high official, had been placed in the pit with more than half of it above ground. Then there were offered to the deceased a pig's head, some wine (part of which was poured out on the ground), some pork, some sea slugs, and some of the muscles from the fin of a large shark. Again spirit money was burned as an offering.

Then the geomancer, or professor of *fengshui*, very carefully chose the exact place to put down the coffin. He used the *lo-p'an*, which has a compass, and was extremely careful to put the coffin in just the right direction. A red string was pinned exactly in the center of the lid, from end to end. Another red string was held in the air above the lid, and by means of the *lo-p'an* aligned in exactly the right direction; then the coffin was moved until the lower string was exactly under and parallel to the upper string. This process took about an hour, several men cooperating. It was extremely important, for the coffin and the corpse must lie in exactly the right direction to make the *fengshui* the best, for that would determine the future prosperity of the Lei family and its descendants.

Two jars or jugs filled with the ashes of the spirit money were placed at the foot of the coffin. At the head were two jars filled with *chiu mi*, or rice from which wine is made, one of the best kinds. These jars are called *i-shih-kuan* or food jars. The rice they contained was food for the dead. Before filling in the grave, rice was thrown on and over the coffin and incantations pronounced by the professor of *fengshui*. The incantations included the fondest wishes of the family—may the descendants increase and multiply, become rich, have many sons, be happy, and become officials.

The rice that is thrown is called *fu-lung-mi*, because throwing it is a means of calling the mountain dragon to come to the coffin and the grave so that the *fengshui* will be good and all will prosper. The rice in the *i-shih-kuan* is for the dead person to eat.

Some packages of unburned spirit money were placed in the coffin, some of them including lists of the clothing, jewelry, and other things that were put in the coffin, so that the deceased person would know about it.

Over a thousand strings of cash were used to pay the laborers who carried and helped in other ways that day. During the parade and

until arriving at the grave, a live rooster rode on the coffin, a means of keeping away demons.

The two vessels containing ashes are regarded as containing money that the deceased person can actually use in the spirit world. If the family of the deceased is wealthy, the chicken may be given to the *fengshui* professor who performs the ceremony, but if they are poor or if they so desire, they may keep it and eat it themselves. Finally, the pig's head, the meat, and the wine are offered to the deceased. The descendants kowtow three times to the deceased, and firecrackers are set off.

Three days after the burial the descendants of the deceased and a Taoist priest go back to the grave. They burn a deed as a ceremony of purchasing the burial place and report to the rulers of Hades. The Taoist priest urges the dead person not to get angry because he or she has died, and not to do evil things such as turning into a demon and harming people.

About the year 1917 a relative of a deacon of the Baptist church of I-pin, Mr. Chao Lan-t'in, died and was buried by Mr. Chao in the burial ground of the church of which I was then pastor. It was later disclosed that Mr. Chao, contrary to the church customs, had secretly engaged a *fengshui* professor to choose a lucky spot, and at the burial to point the coffin in the right direction. After a discussion by the church executive committee, Mr. Chao was required to remove the dirt from the grave, slightly change the direction of the coffin, and again cover the coffin with dirt.

In West China coffins are generally not buried deep under the ground. The hole is dug only about one-half or one-third the depth of the coffin; the coffin is then placed in the hole and covered by a large mound of dirt. Sometimes lime is placed under and around the coffin to keep insects away. It is customary on the first three nights after the burial to burn at the grave three bundles of rice straw called "fire-flame packages" in the belief that it will keep the dead person from getting cold.

On March 27, 1930, I witnessed a funeral at Li-tuan-ch'ang, southeast of I-pin. The following objects and figures, all of which were made of paper and braced by strips of wood, were burned as offerings to the dead person: A large sedan chair with carrying poles and two laborers to carry it, a man mounted on a horse, a manservant and a maidservant, a cook with cooking utensils, four soldiers to serve as a bodyguard, a small house, a gold hill and a silver hill, gold and silver imitation ingots, spirit money, and clothing made of paper. I have

heard of other funerals in which opium pipes, rickshas, automobiles, and other modern things were burned. According to the testimony of the participants and many others, it was believed that these things were transformed by burning into similar things that could be used by the deceased persons in the spirit world.

According to ancient custom, after the death of a parent or a grandparent a three-year period of mourning is observed. During that time the descendants avoid wearing their best clothing. At the end of a year priests are called to conduct memorial ceremonies for a day or more, including the chanting of their sacred books. This is also done at the end of the second year. At the end of the third year mourning is discontinued, the relatives appear in full dress, and there is a feast.

The following is my translation of a deed such as is burned at funerals in West China. These are printed and sold in Chinese shops. The blanks are to be filled out with Chinese pen and ink before the funeral.

Burial Deed

The *yin-yang* department — for the issuance of a deed. Now _____ of the great Chinese Republic, taking orders (from the department) to finish the legal procedure, thankfully asks for the good luck and filialness of _____, prostrating for (the dead person) _____. He was born in _____ (year), in _____ (month) on _____ (day), and at _____ (hour). He grew up in _____, and lived _____ years. His living was limited, so he died in _____ (year), _____ (month), _____ (day), and _____ (hour). Now having divined a lucky time, at _____ (time) he came to this mountain to be buried. The God of the Earth received (the deceased) _____ for the amount of money nine thousand nine hundred and ninety cash, and with a five-colored ribbon takes the dragon son's hill, a lucky place. One home through the heart (right on the spot, dig a hole). The size of the hole is 18 steps. It is located at _____ hill, facing _____ direction. This location is sold to _____ for burial purposes. On the east is the heavenly green dragon, south is the heavenly red bird, west is the heavenly white tiger, and north is the black bird. In the center is the Kou-ch'eng star, above the sky cover. Below is the respectful earth department, and the four trigrams, *chien*, *kun*, *hsuen*, and *chui*, so the eight trigrams are divided very clearly.

While living, he dwelt in the house; now dead, he is buried in this tomb. Now, relying on this boy wearing green clothes (a heavenly messenger), we pay the money. Afterward this will be a burial ground forever, so that the nine palaces (in paradise) will give birth to honored sons. Then the eight trigrams will protect your children. The buried corpse cannot be expelled. No one can invade the old tomb. If there are spooks or demons or a property owner who comes to occupy this grave, let the dead person who receives the ground with this deed report to the goddess of heaven, and let him be examined and punished according to law.

This deed should be given to the dead person to be kept forever as evidence.
 In the heavenly ——— (year), ——— (month), and ——— (day).
 Witnessed by those who sold the ground,
 The master of the year and month, Chang Li-t'u;
 The heavenly witness, Li T'ing-hsü;
 The middleman from below, Prince Tung Wang (King of the East);
 The reception middleman, Hsi-wang-mu (Western Queen);
 The middleman who persuaded (to agree to sell), Shih Kung-t'ao;
 The guarantor middleman, Chin Shang-pu;
 The middleman who paid the money, Pai Ho-hsien;
 The writer middleman, Yen Ho-chin;
 (At the top on the left in very large letters):

FOREVER TEN THOUSAND ANCIENT TIMES,
 TEN THOUSAND AUTUMNS,
 ETERNAL EVIDENCE.

RELIGIOUS BACKGROUND

EARLY RELIGION OF CHINA

Chinese religion may be compared to a large tree which has a main trunk, three large branches, several smaller branches, and many twigs attached to the trunk and branches. The main trunk from the ground to the top of the tree is the popular religion of China, and the three main branches are Buddhism, Taoism, and Confucianism. Since the T'ang dynasty, Islam has had a place, and in recent years the Christian religion. Smaller branches are the Ru T'an, the Wu Chiao, and the T'ung Shan She. The twigs are the numerous sects of Buddhism and Taoism and of the lesser religions. There is also a main root and several large branch roots, besides many smaller ones. The main root is the ancestor of the popular religion of China, which can be traced back more and more dimly through the Chou into the Shang dynasty, and into the late Neolithic times. One large branch root represents influences from India, chiefly through Buddhism. Other smaller roots have given China contacts with western Asia and Europe and with ethnic groups north, east, south, and west of China.³

The Chinese have from very early times been an agricultural people. and the family has been the main social unit. Filial piety has been the cardinal virtue and ancestor veneration the main feature of Chinese society and religion. It was believed that the souls of the deceased ancestors continue to live after death in the spirit world.

³ In the following paragraphs nearly every statement can be supported by many references. However, the facts are so well known to scholars that most references will not be cited.

They need the same things after death as before, such as food, clothing, weapons, tools, ornaments, and later, money. These objects were provided by the living descendants. Many of them were buried with the dead in their tombs, but food and wine and later spirit money were afterward provided through sacrifices and spiritual offerings. While they were living and after death, the ancestors were treated with honor, respect, and affection. Though the deceased ancestors were dependent on the living descendants, they in turn blessed and helped their descendants, giving them success, prosperity, and happiness. At the memorial feasts the deceased were believed to be present and to partake of the food and wine. At these feasts there was an impersonator of the dead ancestor, a male descendant of the deceased.

During the Shang dynasty the offerings to the dead included wine, cattle, horses, dogs, pigs, and sheep, and sometimes wild boars and wild birds, besides chariots, weapons, dishes, cooking utensils, tools, ornaments, bronzes, and pottery. No grains or vegetables were offered, but in the Chou dynasty these were added (Creel, 1935b, pp. 199-200, 334).

During the Chou period the emperor and other rulers had ancestral temples in which ancestral spirit tablets of both husbands and their wives were kept, watched over by a caretaker. The sacrifices, which were family affairs, were offered by the heads of families. Kings and other high officials were often assisted by others of lesser rank. The ceremonies of ancestral veneration were regularly performed at certain periods and seasons, but on special occasions also there were offerings and worship. Among these occasions were the birth of a son, a marriage involving the coming of a new person into the family, and the coming of a son to maturity. The ancestors were often asked for advice.

An important question is, what did the ancient Chinese seek in their religious worship and ceremonies? From inscriptions on the oracle bones and on ceremonial bronzes we learn that a primary desire was for numerous descendants, so that the ancestral ceremonies and offerings would never cease. Other desires were for long life, prosperity, happiness, old age with honor, protection from diseases and enemies, victory in war, and social and official status (*ibid.*, pp. 332-333).

Divination was very common. The guidance and the advice of the ancestors and of the gods were sought to learn whether or not to go to war, whether to make a journey and when to begin it, whether or

not and when to offer sacrifices, and to solve many other problems. During the Shang dynasty tortoise shells and scapulas and long bones of cattle were used. During the Chou dynasty tortoise shells and millet foil were used. The Book of Changes is a book of divination enabling one to determine what is lucky or unlucky by referring to the 64 diagrams.

In the Chou dynasty there were witches and wizards who were believed to have power to communicate with the deceased ancestors and with the gods. Like modern mediums, it was thought that they obtained messages and advice from the celestial beings. They also performed magical ceremonies to heal diseases, to cause rain, to insure good crops, and for other purposes. Dreams were used and interpreted in divination. It seems very evident that in modern times the sorcerer, or *tuan kung*, of the Wu Chiao, the mediums of the Ju T'an, and many Buddhist and Taoist priests are the descendants of the witches, wizards, sorcerers, and mediums of the Chou dynasty.

In ancient China there were no official or celibate priests. The ceremonies of ancestor worship were conducted by the male heads of families. Persons of high rank were sometimes helped in the conduct of these ceremonies by officers, servants, and even slaves, who knew the ceremonies and how they should be conducted.

In the Chou dynasty there was a moral development or reformation among leaders and scholars in ethics, politics, and religion, which changed the attitude toward gods and toward human conduct. The gods were believed to be righteous and to require good moral conduct on the part of men, rewarding the good and punishing the evil. This moral reform led to protests against the sacrificing of human beings at funerals and burying them alive with the dead (*ibid.*, p. 344). This was centuries before Roman law prohibited the sacrifice of human beings among the Druids of western Europe. While human sacrifice did not entirely cease, in later Chou times many Chinese instead made wooden or straw images of human beings and buried them with their dead. I have seen a number of these wooden images that were deposited in late Chou tombs near Changsha.

There was also worship of the gods, although no images were made of them. The ancestors, if not worshiped and regarded as deities, were nearly so. Among the Shang dynasty Chinese the chief god was Ti 帝 or Shang Ti 上帝. The word Shang Ti means ruler above, or god above, or possibly the higher or supreme god. He was not the one and only god, and there is no certain evidence that Chinese religion was ever monotheistic, a statement that can safely be made

of the non-Chinese ethnic groups of eastern, southern, and central Asia. Other Shang dynasty Chinese gods were the Dragon Woman, the Eastern Mother, the Western Mother, the East, the West, the South, the Ruler of the Four Quarters, the Earth or Mother Earth, the Snake Spirit, and King Wind (*ibid.*, pp. 180-184).

Lesser deities during the Chou dynasty included the Father of War, the Father of Husbandry, the Ruler of Cold, the Father of Cookery, and the Six Honored Ones. In addition the sun, the moon, the stars, mountains, rivers, springs, and other natural features apparently were worshiped.

As previously stated, among the Shang dynasty Chinese prior to their conquest by the Chous, the highest god was Ti or Shang Ti. Among the Chou people of that time the chief god was T'ien 天 or Heaven. In early Chinese literature this symbol resembled the picture of a man, but it gradually changed and was finally written in its present form 天. After the conquest the Chou dynasty Chinese identified T'ien and Shang Ti, regarding them as the same god and using the two terms interchangeably. He was the highest god, a god of righteousness interested primarily in human beings and human society, and rewarding the good and punishing the evil. This was not monotheism, for there were lesser deities, and during the following centuries the number of lesser deities increased until there were thousands.

While the *yin-yang* concept cannot with certainty be traced back of the fourth century B. C., for over two thousand years it has played such an important part in the life, thought, customs, and religion of the Chinese that we mention it again here. The explanation of this concept will be given later under the popular religion of West China.

THE GREAT RELIGIONS

CONFUCIANISM

Confucius was born in 551 B. C. and died in 479. He lived at a time when China was in a state of chaos, with deplorable economic, moral, political, and social conditions. The Kingdom of Chou was so weak that the feudal lords did almost as they pleased, and wars were numerous and frequent. Among the rulers intrigue and assassinations were common, and hunting, warfare, and extravagance were their main interests. The sufferings of the common people were almost unbearable, for they had to fight for their rulers, were very heavily taxed, and were ruthlessly punished for failure to cooperate

and to obey their masters. The aim of government was not the welfare of the people, but the aggrandizement of their rulers. (Creel, 1949, pp. 2, 107, 112, 143.)

Confucius made a sincere and lifelong attempt to reform the society in which he lived. He believed that the aim of government should be the welfare of the people, and that rulers should be chosen not because of heredity and wealth, but on the basis of virtue and ability, a very uncommon belief for his day. He sought a high official position for himself so that he could carry out his plans for reform, but failing in that he taught his principles and beliefs to his pupils and disciples, endeavoring to inspire in them faith and loyalty to the ideals and plans that were dear to him. He aimed to find and train for official positions men who were good, honest, and efficient, and to induce the rulers to entrust to them the powers of office (*ibid.*, pp. 2-3, 4, 52, 69, 119, 157, 159, 166, 171, 222).

Good character was to be achieved by education and self-cultivation. Of great importance were sincerity and the willingness to correct one's faults. Loyalty, sincerity, good faith, and propriety or decorum were strongly emphasized. To Confucius propriety or good ceremonial was inseparable from, and the natural expression of, good character (*ibid.*, p. 129).

The ideal people who were to control government were called *chün-tzu*, or gentlemen or princely men. Though they were chosen for their virtue and ability and trained for their work, they might come from the poorest and humblest of homes. These rulers should be examples of good conduct and be devoted to the common good.

Confucius was one of the noblest reformers who ever lived. He had sympathy for and faith in the common man, and his purpose was to reform society and make a better world. He died believing that he had failed, but he left behind him followers who were devoted to his ideals and taught them to others. Thus his influence was passed on to future generations.

Confucius did not intend to found a religion, and many assert that Confucianism is not a religion. But the belief in Heaven and Shang Ti and in lesser deities, filial piety, and the ceremonies of ancestor veneration and to commemorate Confucius and his disciples have caused Confucianism to be a religion to hundreds of millions of people in Asia. While the Confucianism in some parts, at least, of the Confucian Classics and that which has come down to modern times is believed by some scholars to be in some ways a degenerate Confucianism (*ibid.*, pp. 77, 106, 110-111), it has not lost all its original values.

In them are such high moral, social, and religious ideals and teachings that Confucianism has been for centuries the main source, or at least one of the main sources, of high ideals and teachings in China, Korea, and Japan. It is also a fact that during recent centuries Confucianism has inspired democratic movements in Europe, especially in France, and in the United States (*ibid.*, pp. 254-278).

From the beginning, Confucianism has had rivals. Among these were the Moists, the Taoists, and the Legalists. By the time of the Han dynasty Moism had practically disappeared, but before that and afterward the Taoists and the Legalists were very powerful and influential. Confucianism influenced its rivals, and in turn was influenced by them. From Taoism as a religion came mysticism, divination, and superstition. Through the influence of the Legalists Confucius and Confucianism were sometimes made out to be supporters of despotic rulers and of despotic governments. Even the popular religion of the common people has infiltrated into Confucianism.

The writer has read and studied the Confucian Classics in the Chinese language and in English translations. He has also consulted some Confucian scholars and many of the common Chinese people. It seems to him that many educated Chinese, in T'ien, Shang Ti, and other terms, had high conceptions of a supreme god, and that some of the common people had similar ideals expressed in the terms T'ien, Shang Ti, and T'ien-lao-yeh, or the Aged One in Heaven. Never have the Chinese made images of this deity. About the year 1916 a Chinese scholar, Mr. T'ien, joined the church at I-pin of which I was then pastor. Mr. T'ien asserted that he first acquired the idea of a Supreme God from the study of the Confucian Classics. Rev. Frank Rawlinson, D.D., for many years the editor of the Chinese Recorder, conducted researches for more than 25 years and embodied the results in a book, "Chinese Ideas of the Supreme Being." He found evidence that for centuries some of the choicest souls in China have had a high conception of the Supreme Being, who is a spirit, a moral being, omnipresent, omniscient, omnipotent, eternal, compassionate, and loving, and is a personality. The worship of this being he found to be both private and public. At Peking the emperors of China worshiped Heaven on the Altar of Heaven on behalf of the Chinese people (Rawlinson, 1927). Confucianism is probably the main source of this conception.

It has already been noted that in the Confucian Classics the supreme ruler is T'ien and Shang Ti. These two terms are interchangeable and refer to the highest deity. He is majestic, righteous, just, intel-

ligent, compassionate, and powerful, and controls the universe. His primary interest is in humanity. This concept did not become a monotheism, for there were lesser deities whose numbers increased during later centuries, but it was a near approach to it. Confucianism produced some high religious ideals and high moral ethics which were a refinement of the earlier moral and religious ideals and practices of China. The following are a few quotations from the Confucian Classics (Legge, 1899b, vol. 3).

It is virtue that moves Heaven; there is no distance to which it does not reach. Pride brings loss, and humility receives increase; this is the way of Heaven. (P. 52.)

Heaven hears and sees as our people hear and see; Heaven brightly approves and displays its terrors as our people brightly approve and would awe; such connection is there between the upper and lower (worlds). How reverent ought the masters of territories to be. (P. 56.)

The way of Heaven is to bless the good and to make the bad miserable. (P. 90.)

Good and evil do not wrongly befall men, but Heaven sends down misery or happiness according to their conduct. (P. 101.)

Heaven loves the people, and the sovereign should reverently carry out (this mind of) Heaven. (P. 127.)

Great Heaven has no partial affections [favorites]; it helps only the virtuous. (P. 212.)

The king twice bowed (low), and then arose, and replied, "I am utterly insignificant and but a child, how should I be able to govern the four quarters (of the kingdom) with a corresponding reverent awe of the dread majesty of Heaven." (P. 241.)

Oh vast and distant Heaven, who art called our parent. (P. 361.)

The doings of high Heaven have neither sound nor smell. (Pp. 379-380.)⁴

Great is God, beholding the lower world in majesty. (P. 389.)

Great Heaven is very intelligent. (P. 416.)

Great Heaven makes no mistakes. If you go on to deteriorate in your virtue, you will bring the people to great distress. (P. 417.)

To see what is right and not to do it is want of courage. (Legge, 1885a, p. 23.)

What I do not wish men to do to me, I also wish not to do to men. (Ibid., p. 54.)

⁴ Note by Legge; "These two lines are quoted in the last paragraph of the Doctrine of the Mean, as representing the ideal of perfect virtue. They are indicative of power, operating silently, and not to be perceived by the senses, but resistless in its operation."

When you have faults, do not fear to abandon them. (Ibid., p. 119.)

Now the man of distinction is solid and straightforward, and loves righteousness. (Ibid., p. 169.)

The Master said, "The determined scholar and the man of virtue will not seek to live at the expense of injuring their virtue. They will even sacrifice their lives to preserve their virtue complete." (Ibid., p. 223.)

What you do not want done to yourself, do not do to others. (Ibid., p. 229.)

The Master said, "To have faults and not to reform them—this, indeed, should be pronounced having faults." (Ibid., p. 231.)

The Master said, "The superior man holds righteousness to be of highest importance." (Ibid., p. 271.)

From the beginning of the Han period (206 B. C.–A. D. 221), many emperors have at least outwardly honored Confucius and have used and patronized the Confucian scholars. For many centuries the high government offices were filled by an open competitive civil service examination system in which the main qualification for attaining office was a knowledge of the Confucian Classics. Every county seat had at least one Confucian temple in which there were tablets to Confucius and his main disciples, and where twice a year ceremonies were held to honor Confucius and his disciples. Twice a year Confucius has been respectfully commemorated in the Chinese schools.

Confucianism has had much influence on the common people and on the popular religion of China, and consequently nearly all the divinities in the Chinese temples, unlike those of Greece and Rome, are believed to be morally good and to require good conduct on the part of the people. While in many Tibetan temples there are copulating gods,⁵ and in both Tibet and India are gods and goddesses who apparently glory in killing and in cutting off heads, no such gods are found in the temples of China. Owing not a little to the influence of Confucius and Confucianism, the moral tone of the popular religion of China is comparatively good.

TAOISM

According to the traditional interpretation, the founder of Taoism was Lao Tzu or Li Lao Chün, who was born in 604 B. C. and was a

⁵ It is said that among some philosophic Buddhists in Tibet this sexual act symbolizes the union of subject and object, of man and God. However, all the Tibetans and others with whom I talked in eastern Tibet explained that copulating put the god in a good humor so that he would be more likely to grant the petitions of the worshippers.

contemporary of Confucius (Hume, R. E., 1938, p. 128; Gowen and Hall, 1926, p. 70). He was keeper of the government archives at Lo Yang and met Confucius in an interview that was not very satisfactory to either. He later became so discouraged that he withdrew beyond the western barrier. The keeper of the barrier persuaded him to write down his teachings, the result being the Tao Te Ching, the Classic of Learning and Virtue, which contains only about 5,000 words. Not a few modern scholars now date Lao Tzu about the fourth century B. C., a century or more after the time of Confucius. Some scholars even doubt that Lao Tzu ever lived, that he wrote the Tao Te Ching, and that he ever met Confucius. (Lataurette, 1920, pp. 21-22; Creel, 1949, pp. 195, 247).

At the time of Confucius and Lao Tzu, because of the weakness of the central government, the corruption of the rulers, the wars between the feudal lords, and the exorbitant taxes, China was in a deplorable condition. Confucius endeavored to reform and save society. Lao Tzu and his followers, including Chuang Tzu and Lieh Tzu, expounded a philosophical teaching which they believed would bring peace to individuals and to society. Confucius believed that man would remain good if properly taught. The Taoists asserted that mankind would remain good if left alone. Confucius believed in a strong government, Taoism in no government at all, or at least in very little government. A main doctrine of Lao Tzu was *wu wei* or nonaction. He advised people not to strive, but to get into harmony with Tao, which is the course of nature, the way, the path, the road, the moral and physical order of the world, the basic principle of the universe, reason, the ultimate, God (Hume, R. E., 1938, pp. 137-139; Creel, 1949, p. 196). It is formless, unchanging, eternal, self-existent, and self-developing, the one abounding source of all things, creative, indescribable, great All-father, Mother (Hume, *ibid.*, pp. 138-139). This is a philosophy too abstruse and mystical to be understood by or to appeal to the common people of China (Lataurette, 1920, p. 28; Edkins, 1879, p. 381), yet it has affected the conduct of the people in subtle ways and is partly responsible for their natural poise and flexibility. In addition to the doctrine of inaction, there is credited to Lao Tzu and his followers some high ethical teachings, including the return of good for evil, humility, and sincerity (Hume, R. E., 1938, p. 130; Gowen and Hall, 1926, p. 71).

The following are selections from the Tao Teh Ching as translated by Lin Yutang (1942a).

Tao is all-pervading,
And its use is inexhaustible !
Fathomless !

Like the fountain head of all things. (P. 585.)

In loving the people and governing the kingdom,
Can you rule without interference? (P. 587.)

In his relations with others, he loves kindness ;
In his words, he loves sincerity. (P. 587.)

He who holds fast to the Tao of old
In order to manage the affairs of Now
Is able to know the Primeval Beginnings
Which are the continuity of Tao. (P. 590.)

Attain the utmost in humility ;
Hold firm to the basis of quietude. (P. 591.)

Of the best rulers,
The people only know that they exist. (P. 591.)

Banish learning, and vexations end. (P. 593.)

The marks of great virtue
Follow alone from the Tao.
The thing that is called Tao
Is elusive, evasive,
Evasive, elusive,
Yet latent in it are forms. (P. 594.)

To yield is to be preserved whole.
To be bent is to become straight.
To be hollow is to be filled.
To be tattered is to be renewed.
To be in want is to possess.
To have plenty is to be confused. (P. 594.)

Before the Heaven and Earth existed
There was something nebulous :
Silent, isolated,
Standing alone, changing not,
Eternally revolving without fail,
Worthy to be Mother of All Things.
I do not know its name
And address it as Tao. (P. 596.)

Tao is absolute and has no name. (P. 601.)

The great Tao flows everywhere,
(like a flood) it may go left or right.
The myriad things derive their life from it,
And it does not deny them. (P. 602.)

The Tao never does,
Yet through it everything is done.

If the kings and barons can keep the Tao,
 The world will of its own accord be reformed.
 When reformed and rising to action,
 Let it be restrained by the Nameless pristine simplicity.
 The Nameless pristine simplicity
 Is stripped of desire (for contention).
 By stripping of desire quiescence is achieved,
 And the world arrives at peace of its own accord. (P. 603.)

The softest substance in the world
 Goes through the hardest.
 That-which-is-without-form penetrates
 that-which-has-no-crevice;
 Through this I know the benefit of taking no action.
 The teaching without words
 And the benefits of taking no action
 Are without compare in the universe. (P. 607.)
 Win the world by doing nothing. (P. 613.)

Therefore the sage desires to have no desire,
 And values not objects difficult to obtain. (P. 617.)

For love is virtuous in attack,
 And invulnerable in defense.
 Heaven arms with love
 Those it would not see destroyed. (P. 618.)

When people are hungry,
 It is because their rulers eat too much tax-grain.
 Therefore the unruliness of hungry people
 Is due to the interference of their rulers. (P. 621.)

Who can have enough and to spare to give to
 the entire world?
 Only the man of Tao. (P. 622.)

During the centuries after Lao Tzu, the Taoist religion steadily degenerated. Search for the elixir of life and longevity and even immortality, divination, witchcraft, and the use of magic ceremonies to control and exorcise demons, which were believed to cause sickness and other calamities and to accomplish other purposes, became the essential features of the Taoist religion. Ch'in Shih Huang, "the first emperor," rejected Confucianism and favored a degenerate Taoism. Some of the Han dynasty emperors favored Taoism, and during the latter half of the second century A. D. Chang Tao-ling, the first Taoist pope, practically made Taoism identical with the popular superstitions of his time. The emperors of the T'ang dynasty generally favored Taoism because they believed themselves to be descendants of Lao Tzu. From the time of Ch'in Shih Huang to the end of the Manchu dynasty (1912), some emperors favored and

promoted Taoism, whereas others persecuted and sometimes tried to exterminate it.

After the coming of Buddhism to China, Taoism and Buddhism became great rivals, and to some extent they have remained rivals ever since, although after several centuries they seemed to settle down to friendly coexistence. As is so often the case with rivals, each borrowed from the other, and each influenced the other. Through the influence of Buddhism, Taoism now developed a trinity, Lao Tzu (now deified), P'an Ku, and the Pearly Emperor, together with a great pantheon of gods; the use of temples and monasteries; the employment of monks, first allowed to marry, but later generally required to be celibate; heaven and hell; charms and incantations; more magic ceremonies to bring rain, to cause good crops, to give general prosperity, to accomplish other desired results, and to heal diseases and give protection from other calamities by the exorcism of demons (Lataurette, 1920, pp. 125-126). Taoist sacred books were written closely imitating those of the Buddhists.

Philosophical Taoism, a mystical philosophy with high moral teachings, has always been understood by and has appealed to a limited number of elite scholars. Among the great mass of priests and worshippers, Taoism as a religion has become so degenerated that if one desires to study the modern superstitions of the Chinese people, there is probably no better way than to study the beliefs and practices of the Taoists.

For many centuries religious Taoism identified itself with the superstitions of the Chinese people and so won and held their allegiance. But what has in the past been a great asset, has in recent years become a decided handicap. The people of China are emerging into a new age, characterized by an intellectual and psychological awakening and enlightenment, when religions using primitive methods and psychology and preying on the superstitions of the ignorant are doomed to rejection.

BUDDHISM

Buddha, whose real name was Gautama, was born in a noble and wealthy family in northern India. Different authorities give different dates for his birth and death, but all agree that he lived to be 80 years old, and modern scholars generally date his birth at 563 B. C. and his death at 483 B. C.

Buddha was reared in luxury and protected from the hardships of life, but later he was so impressed by human sorrow and misery, caused by sickness, old age, and death, that he left his home and

his wife and child to become a wanderer seeking enlightenment and salvation. It is said that he first tried philosophical speculation and later, failing to find a solution by that method, tried asceticism. He finally realized that this method also was useless, and at the age of 35 attained enlightenment. He perceived the four noble truths and the noble eightfold path. The four noble truths are: first, all existence involves suffering; second, all suffering is caused by desire; third, all suffering will cease on the suppression of desires; and fourth, every person should live according to the noble eightfold path. This path is right belief, right aspiration, right speech, right action, right livelihood, right endeavor, right thought, and right concentration. The purpose of salvation, according to Buddha, is the attainment of Nirvana. This is interpreted as "the highest happiness." Some scholars regard this as the extinction of all consciousness and personality, but this interpretation is not accepted by all Buddhists. It would seem to be a negative condition, "a passionless peace."

Buddha rejected the gods of India, the monism of the philosophers, and the many deities in the popular religion. He did not believe in and teach about any god. He rejected caste, the numerous and elaborate magical ceremonies and rituals, and the idea of a permanent personality or soul. However, he accepted the prevailing pessimistic view of life, that it is so full of disappointments, suffering, and sorrow that it is of little value, and the belief in karma and transmigration.

Having found the way of salvation and been enlightened himself, he began to instruct disciples and to send them out to teach others the way of salvation. While he gave a place to laymen, he required celibacy of his closest followers and organized them into a society. After his death they continued to preach his doctrines. Buddha himself was later deified, and the gods of India were again worshiped by the Buddhists, who added many deities of their own to their pantheon. Magic ceremonies and festivals similar to those of India and the use of charms and incantations later became a vital part of Buddhism.

Buddhism spread into Ceylon, Cambodia, Burma, Siam, Tibet, China, Korea, and Japan. In the southern countries it remained truer to the historical doctrines and practices of Buddha and is called "the lesser vehicle." In Tibet, China, Korea, and Japan it has changed greatly. Here it has a large pantheon of gods and goddesses, many heavens and hells, elaborate religious festivals and ceremonies, many temples containing images of the gods, and charms and incantations.

In Hinayana Buddhism the salvation offered was relief from transmigration and rebirth into a happy state of Nirvana, which was virtually a state of unconsciousness with the loss of individuality. This could be attained through an age-long, patient, and arduous accumulation of positive merit.

In Mahayana Buddhism people were saved from hell into heaven and from rebirth by the help of Buddhas and Bodhisattvas, and there was the possibility of a single, sudden enlightenment. Much magic and many magic formulas were used, and people were encouraged to repeat the name of Buddha or the magic phrase *Om-mani-padme-hum*. Both Hinayana and Mahayana Buddhism were introduced into China and Tibet, but only Mahayana Buddhism endured.

It is generally accepted as a fact that Buddhism entered China during the first century A. D. Translation of the Buddhist scriptures was soon begun, and Buddhist priests continued to come from India for over 600 years. Until the time of the Western Chin dynasty, the work of translation was done primarily by monks from India assisted by Chinese scholars, but from that time on it was done primarily by Chinese. At first the only monks were from India, but in A. D. 336 Chinese priests were ordained, and their number increased rapidly. Buddhism was becoming indigenous and made amazing progress in northwest China, especially among nomadic peoples.

Buddhism has often been opposed by Chinese scholars because of its pessimism and other-worldliness, but many have been favorably attracted to it by its profound philosophical ideas and the elegant literary style in the Chinese translations of the sacred books. Buddhism has adapted its moral and religious teachings to those of the Chinese, so that they are more appealing to the Chinese people.

In China Buddhism developed a goodly number of "schools" or sects, each emphasizing certain teachings and practices which they believed to be especially important. Their differences no doubt meant a great deal to their founders and to the priests and leading laymen in charge of these "schools" and their temples. Yet it is evident that these differences do not mean very much to the majority of the Chinese people, who gladly worship in Buddhist, Taoist, and Confucian temples and believe in the proverb, "The three religions are one." It is very likely that the differences in the various sects were less emphasized in West China than in North, East, and South China. During his 30-odd years in West China, the writer visited many Buddhist temples and talked with many priests. Most of the priests were unable to explain the differences, and either asserted that there were no sects, or that they "differed not much."

During the past centuries Buddhism has won and held the loyalty of the Chinese common people because it has adopted and accommodated itself to the primitive practices and superstitions to which they were accustomed and was believed to make available magical or superhuman power. By the worship of the gods, the chanting of sacred books, and other religious ceremonies, and the use of charms and incantations to protect people from demons and various calamities and to guarantee success and happiness and the satisfying of human needs and desires in this world and in the world to come, it won the hearts of the common people of China. But in the latter part of the 19th and the early decades of the 20th century, there was a great intellectual awakening and enlightenment in China, together with disastrous foreign wars, the weakening and final collapse of the Manchu dynasty followed by chaotic conditions, many civil wars, two world wars in which China became much involved, the Communist uprising, and growing economic distress which caused many families to become bankrupt and hundreds of millions to endure the hardships of poverty. Consequently, conditions in China became fluid and changing, and many of the people of China questioned and even rejected Buddhism and Taoism because of their many superstitious teachings and practices.

In an article, "Buddhism and Chinese Culture," and in a later book, "Buddhism in Chinese History," Prof. Arthur F. Wright divides the history of Buddhism in China into four periods (Wright, 1957, 1959). The first he calls the Period of Preparation, A. D. 65-317. He shows that the political, social, and intellectual events of these years were such as to make the people skeptical of their own and susceptible to a foreign religion and its cultural accompaniments. The Han dynasty weakened and fell, and society was disintegrating. Former moral, social, and political ideals and customs were questioned and discredited. At the same time the Buddhist sacred books were being translated, and Buddhist teachings and practices were being adapted to those of the Chinese (Wright, 1957, pp. 19-24; 1959, pp. 21-41).

The next period, A. D. 317-589, he calls the Period of Domestication. He states that the process differed in the north and in the south, but everywhere Buddhism attracted all classes of society, from the rulers and educated aristocrats to the lowly peasants. Buddhist ideas and customs were brought to the Chinese, but very many of them were Sinicized and adapted to those of China. This resulted in new literature, new forms of art and architecture, new laws,

new music and musical instruments, and changes in the theory and practice of medicine and in religious practices, doctrines, and philosophy (Wright, 1957, pp. 24-31; 1959, pp. 42-64).

The third period, A. D. 589-900, the author calls the Period of Acceptance and Independent Growth.

We shall see that under the Sui and the T'ang those elements of Buddhism which had been domesticated in China were accepted—regardless of the predilections of individual rulers—as integral parts of social, political, economic and cultural life; the prevalence of Buddhist belief in all classes of society made it essential for those in power to take account of this in formulating state policies at all levels. Acceptance by the populace and by the state—these are the conditions that make possible the notable development of Buddhism in this period of independent growth: the creation of a Buddhism by and for the Chinese. (Wright, 1957, pp. 31-32.)

"In the life and culture of the upper class, Buddhism was everywhere accepted." Buddhism was the dominant intellectual, spiritual, and esthetic interest of the educated. Officials and nobles were munificent patrons of Buddhism. Buddhist ideas saturated Chinese literature and pervaded the thinking of the upper classes. It was fully accepted by the common people, even in rural districts. The development of the different schools of Buddhism was part of the process of domestication, carried into this period. Before the end of this period, the decline of Buddhism began (Wright, 1957, pp. 31-38; 1959, pp. 65-85).

The fourth period, A. D. 900 to the present, the author calls the Period of Appropriation. He mentions the fact that Buddhist and Taoist doctrines and practices have been largely amalgamated in the secret societies, and that in the country districts Buddhism has fused with the folk cults, the priests often resembling the shamans of the popular region. Elements of the Buddhist, the Taoist, and the folk religion fused into the popular religion (Wright, 1957, pp. 30-40; 1959, pp. 98-104). Many Buddhist words and phrases are used in the Chinese vocabulary, Buddhist art designs have been adopted, and some Buddhist ideas, such as karma and rebirth, have been transformed and accepted by the Chinese as their own (Wright, 1957, p. 40; 1959, p. 105).

While the eighth century was the golden age of Buddhism in China, the ninth century saw the beginning of its decline. The empire was severely shaken by the rebellion of An Lu-shan. There were attacks and threats of attacks by the Uighurs and the Turks. These humiliated the rulers and impoverished the people, weakening the confidence of the Chinese people in their government and in their culture.

Since Buddhism was interwoven with almost every phase of that culture, it gave attacks on Buddhism a receptive and sympathetic hearing. It was criticized as being a foreign religion, with wasteful expenditures on temples, images, and ceremonies, an idle clergy, and a great deal of tax-free property, and because of its other-worldliness.

During the ninth century there were considerable government opposition and attempts at suppression. The rulers attempted to impose drastic restrictions on Buddhist activities and organizations. In A. D. 842 to 845, there were decrees that Buddhism must be suppressed, an empire-wide destruction of temples, the confiscation of Buddhist lands, and an attempt to secularize the clergy.

At this time there was a revival of Confucianism, which continued into the Sung dynasty. Leading scholars reinterpreted Confucianism and enriched their philosophy by borrowing from both Buddhists and Taoists, developing what has been called neo-Confucianism. This appealed strongly to the educated classes and lessened among them the influence of Buddhism.

It is not certain just when Buddhism first entered the province of Szechwan. The first of the Buddhist caves at Tun-huang in Kansu is dated A. D. 353 (Shih Yai, 1947, p. 1). Some of the local histories of West China claim that certain famous temples were erected during the T'ang dynasty, A. D. 618-907. At Ch'iung-chou, which is southwest of Chengtu, there was a local flood about the year 1947 which washed away a great deal of soil and exposed the foundations and many stone images of a very old Buddhist temple. Most of the articles of scientific value were deposited and displayed in the museum of the West China Union University. On some of the stones were inscriptions dating the temple in the T'ang dynasty. According to the local history, there was at least one other Buddhist temple in Ch'iung-chou in 1947 which was founded in the T'ang dynasty. These were great temples, with very artistic images and carvings; hence Buddhism must have entered Szechwan several centuries earlier.

In the survey of the temples of I-pin conducted by myself and others in 1928 it was found that there were 49 Buddhist temples, 25 Taoist temples, 2 temples of the Ju T'an sect, and 2 Confucian temples. The survey of the temples of Chengtu conducted from 1941 to 1944 revealed that there were still traces of 98 Buddhist temples, 44 Taoist temples, 16 temples of the Ju T'an sect, and 3 Confucian temples. This shows fairly well the comparative strength of the Buddhist and Taoist religions in West China.

MOHAMMEDANISM

In A. D. 757, at the request of the Chinese emperor Su Tsung, 4,000 Moslem troops were sent into China to help in the suppression of a rebellion (Couling, 1917, pp. 378-379; Gowen and Hall, 1926, pp. 119-120; MacGowan, 1906, pp. 319-320). They remained, married Chinese wives, and their descendants were loyal Mohammedans. In the T'ang dynasty, Moslem merchants came to the seaports of China on Arabian vessels. Later, after the victories of Kublai Khan, they came into Kansu and also entered seaports in southeast China, where they remained to carry on trade (Couling, 1917, p. 379; Goodrich, 1959, pp. 125, 134). When Yunnan was conquered, a Moslem was sent to govern the province, and we are told that he governed so well that many of the people became Mohammedans. Great progress was also made in northern China, especially in Kansu and Shensi.

In western Asia, Europe, and Africa, Mohammedanism was often spread by the sword, but in China this method was not used. One way of spreading the religion is by marriage—anyone who marries a Mohammedan must become a Mohammedan. Another way is through the natural increase of their children, and still another way is to adopt orphans, or to purchase children, especially during times of famine, and to bring them up as Mohammedans. There have also been times when China has conquered Mohammedan tribes in Kansu or in central Asia, and members of these tribes have migrated into China and remained there. In these ways Mohammedanism has remained and prospered in China, and it is estimated that their present number is somewhere between 5 and 30 millions, very likely between 10 and 15 millions.

During the last three centuries there have been a number of Mohammedan rebellions, and we shall mention only the three most important. One broke out in Yunnan in 1855, lasting 18 years, during which about a million people lost their lives. The Tungan rebellion in Kansu and Shensi broke out in 1862 and was finally quelled in 1870. In another rebellion which ended in 1877, it is estimated that 10 million lives were lost (Couling, 1917, p. 379).

In China as elsewhere the Mohammedans are monotheists, believing that there is only one god, and that Mohammed is his prophet. They practice circumcision and do not eat pork. The Koran is printed and read in the Arabic, which is the sacred language. They do not worship idols, and they practice polygamy. They have ceremonies to purify themselves before worship. They encourage almsgiving, pray five times a day, and while pilgrimages to Mecca are encouraged, a

worship service has been substituted for the many who are not able to travel so far (*ibid.*; Mason, 1921, pp. 302-303). They give their children a thorough moral and religious education, so that their children almost never give up their faith.

Mohammedanism in China has been much influenced by, and has made many adjustments to, Chinese ideals and customs. In "The Arabian Prophet," S. M. Zwemer says, "It is of deep interest to see how the mass of traditions has been sifted, adjusted, and even deliberately falsified to fit in with Chinese ideas and ideals, an environment which has given the familiar story an entirely new aspect. Confucianism has modified Islam in China." (Mason, 1921, p. ii.)

Prof. Wing-tsit Chan, in "Religious Trends in Modern China," has pointed out that in recent decades there have been some important trends among the Mohammedans in China, namely, a tendency toward liberalism, new attitudes toward the Koran, an intellectual awakening, a new "law-seeking" movement, and closer identification with Chinese national life (Chan, 1953, pp. 188-216). It is difficult, however, to point out any important contribution that Mohammedanism has made to the customs and culture of China.

CHRISTIANITY

The first Christians to enter China were the Nestorians. The famous Nestorian tablet, which was erected in Hsi-an, Shensi, in A. D. 781, and other documents assert that Christianity was first brought to Ch'ang-an in A. D. 635. It prospered for a time under the favor of the emperors, and later there were monasteries in Kansu, farther east, and in Chengtu. In A. D. 845 its leaders, along with the Buddhists, were officially ordered to renounce their faith. There is evidence of the existence of Christianity in the empire during the 10th and 11th centuries. Then we read of the spread of Christianity during the 12th and 13th centuries, and its prosperity continued during the 14th century. Marco Polo found Christians and Christian leaders in different parts of the empire, for their monasteries existed in Yunnan, in Szechwan, and in many other provinces. Nevertheless, the Christians were comparatively few and of little influence, and after the fall of the Yuan dynasty Nestorianism completely disappeared from China.

Roman Catholicism first entered China during the Yuan dynasty. In A. D. 1294 John of Montecorvino, a Franciscan, arrived in Peking. Under the favor and patronage of the emperors, and with the help of other missionaries, he established churches and baptized many

converts in Peking, Zainton, and several other cities. After the fall of the Yuan dynasty Roman Catholicism, like Zoroastrianism, completely disappeared from China.

During the Ming dynasty Roman Catholic missionary work was resumed. The first missionary to come to China was St. Francis Xavier, who died on the island of Shang-ch'uan in 1552 without reaching the mainland. Other missionaries reached Macao and Canton, but not the interior, and Matthew Ricci arrived at Macao in 1582, Nan-chang in Kiangsi and Nanking in 1595. In 1596 he visited Peking, where he settled in 1601. Many other missionaries followed, other organizations later entered the field, and the number of converts increased.

The Jesuits sent a number of scholars to Peking, who made important contributions in astronomy, mathematics, history, geography, mechanics, and art. They brought prestige to the movement, and for a time gained the favor and patronage of the emperor. Other missionaries, mainly from Italy, France, and Portugal, entered and established churches in the provinces of Chili, Shansi, Shantung, Honan, Szechwan, Hukuang, Kiangsi, Kiangnan, Chekiang, Fukien, Kuangtung, and Kuangsi.

The Roman Catholic priests and nuns were zealous in spreading their religion. They opened hospitals, schools, and orphanages, and established churches. Hospitals, by alleviating suffering, lessened opposition and won the hearts of patients and friends. Schools, while helping win the respect of educated Chinese, were places where religion was taught every day and were a means of influencing pupils and their parents. In the orphanages the children were given a living, a home, and an education, and were taught the Roman Catholic religion. The churches were often large buildings in which to worship with dignity and which impressed the people with the greatness of this religion. After the Boxer Uprising and partly with the aid of the Boxer indemnity, the church came into possession of a great deal of property. By 1922 there were approximately 2 million Roman Catholic communicants in China.

Protestant missions in China began in 1807 with Robert Morrison, who had been sent out by the London Missionary Society. He was able to live in the agency of the East India Company in Canton, although confined within the limits of that agency. At that time, according to Chinese law, the death penalty awaited any Chinese who would teach the Chinese language to a foreigner. Morrison had previously studied medicine, astronomy, and the Chinese language. He completed a Chinese grammar in 1812, a Chinese dictionary in 1814,

and published the Bible in Chinese in 1824. His first convert was baptized in 1814, and Morrison died in 1834.

In later years other missionary societies sent missionaries from Europe and from the United States. Many missionaries retired because of ill health, and many others died. Until the opening of Hong-kong in 1841 and of the five treaty ports in 1843, it was not possible for them to enter or to live in China proper. In 1865 the number of missionaries was 112, and of Chinese converts 3,132 (Couling, 1917, p. 463). By the treaty of Tientsin in 1858 foreigners were allowed to travel in the interior, and by the treaty of Peking in 1860 they were allowed to reside, purchase property, and erect buildings throughout China. Since these and other concessions were obtained by military force, it was natural for the Chinese to regard the missionaries as agents of foreign governments and to resent their being in China. The superstitions of the masses and the conservatism of the educated Chinese resulted in much opposition to the activities of the missionaries. Any natural calamity might be blamed on them and result in riots and in persecution. They opened churches, chapels, schools, hospitals, and dispensaries, and often took a prominent part in famine relief. At the time of the third missionary conference in Shanghai in 1890, there were 1,296 foreign missionaries in China, and 17,287 church members. But smoldering suspicion and opposition broke out early in 1900 in the Boxer Uprising, which was encouraged by the Manchu rulers, the object being to drive all the foreigners and their agencies out of China. Much mission property was destroyed, and it is estimated that 212 missionaries and 1,909 Christian Chinese were killed.

Prior to the Boxer Uprising, most of the contacts of the Protestant missionaries were with uneducated Chinese and had for their primary object "the saving of souls." Notable exceptions, and there were others, were the activities of Timothy Richard and Gilbert Reid, who profoundly influenced the young emperor Kuang Hsü, resulting in his reform movement of 1898. By a coup the Empress Dowager put a stop to the proposed reforms and thus helped to bring on the Boxer Uprising.

The defeat of the Boxers, the punishment of the guilty officials, and the imposing of exorbitant indemnities awakened in the Chinese a keen desire to strengthen China by the acquisition of Western learning. The missionaries began to place a stronger emphasis on educational and medical work and on various forms of social service. Wise planning there was to a degree from the time of Robert Morrison,

with a goodly sprinkling of great Protestant missionaries, but from this time on, wise and careful plans and policies became a larger factor in the work. A growing spirit of cooperation arose, especially in educational and medical work, and in the creating and publishing of Christian literature in the Chinese language. The work continued to prosper, and in 1907 there were 3,445 missionaries and 178,354 Protestant church members.

The revolution of 1911, resulting in the establishment of a nominal republic, brought even greater opportunities to Protestant missions. Many of the revolutionary leaders were at least nominal Christians or had been educated in Christian schools. In establishing new laws and new educational institutions, the help of native Christians and Protestant missionaries was often sought and obtained. Religious liberty was recognized by law, and the number of inquirers and of converts steadily increased.

Chinese Christians and missionaries began to see the importance of developing indigenous churches that could in time be self-supporting, self-controlling, and self-propagating, with the development and use of strong and able native leaders. Although heated discussions sometimes arose, in the long run this became the policy of the native churches, of missionaries, and of foreign missionary societies. The wisdom of this policy became evident in 1949, when China became Communist and foreign missionary work in China came to an end.

According to "The Christian Occupation of China" (Stauffer, 1922), published in 1922 but with materials gathered about 1920, there were in China, in 1920, 344,974 Protestant communicants and a constituency of over 600,000. There were 5,607 Protestant Christian lower primary schools with 155,779 pupils, 956 higher primary schools with 32,829 pupils, 291 middle schools with 15,293 pupils, and 14 Christian colleges and universities, the total enrollment being well over 200,000. There were 323 hospitals and 234 dispensaries, besides a goodly number of medical schools and nurses' training schools. In 1949, when the bamboo curtain went down in China, there were at least one million Protestant communicants, among them many very able Chinese Christian leaders.

In "Each with His Own Brush," Daniel Johnson Fleming states that art has always been a handmaid of religion, and that religion has always been a creator and preserver of art. He says that now that Christianity has become ecumenical, established in all parts of the world, one expectantly surveys the younger Christian communities of the world to see what uses of form and color they are making. The

expansion of Christianity into the non-Christian world opens up a new significant period, not only in the expression of the spirit, but also in art (Fleming, 1938, p. 1). By 1948 many new Christian hymns and hymn tunes had been written and were being used by the Chinese Christian Church, and many admirable works of art, both by Catholic and Protestant artists, were to be found in Christian publications, churches, and homes. This is one evidence that Christianity had reached and influenced the souls of the Chinese people.

The Nestorian missionaries came to Sian during the seventh century, and their work spread into Szechwan and Yunnan. By the end of the Ming dynasty, A. D. 1644, Roman Catholic churches had been established in every province of China excepting Kweichow and Yunnan (Lataurette, 1920, p. 107), and we can be sure that it was not very much later when they were established in those provinces. In spite of a number of anti-Christian riots and of persecutions, the number of Roman Catholic adherents in West China has steadily increased.

The first Protestant missionary to visit West China was Griffith John of the London Missionary Society, in 1868. The China Inland Mission soon followed, and later, other missions from Canada, Europe, and the United States. In 1886, 1895, and 1899 anti-Christian riots caused destruction of property and sometimes loss of life. Each time the missionaries were forced to leave, but later returned and continued their work. The revolution in 1911 led to another evacuation, and from 1924 to 1929 a very strong anti-Christian movement hindered the progress of the church and again caused many missionaries to leave.

As in other parts of China, the Christian program in West China included churches, schools, hospitals, and much social service and relief of suffering. In "The Christian Occupation of China" (Stauffer, 1922), it is estimated that in 1920 there were in West China, exclusive of Sikang and Kokonor, 1,904 missionaries, 2,522 full-time native Christian leaders, 732 schools besides the West China Union University, 24,925 pupils, 38 hospitals, 73 dispensaries, and 39,633 church members. In 1940 it was estimated that the number of Protestant church members was about 80,000 (Wu Yi-fang, 1940, p. 111). In vast areas, especially in Sikang, western Szechwan, Yunnan, Kokonor, and Kansu, there were no churches and no church members. In West China as in other parts of China, the influence of Protestant Christianity was far out of proportion to the number of its missionaries and native Christians.

THE LESSER RELIGIONS

NON-CHINESE

CH'UAN MIAO

The Ch'uan Miao are an ethnic group living in the high mountains on the borders of Szechwan, Kweichow, and Yunnan Provinces. Here they have lived for centuries, but their traditions say that they formerly lived in Kwangtung or in Kiangsi Province. They assert that in a war with the Chinese the Miao were defeated and their land, property, and weapons confiscated. They were brought in a forced migration, with their hands tied behind their backs, and released in the mountainous land where they now live (Graham, 1937b).

Though the Ch'uan Miao have clung tenaciously to their own language and customs, there is evidence of cultural diffusion before the migration to West China, as well as in more recent times. For instance, after a corpse has been buried a number of years, the grave is opened, the old coffin is thrown away or burned, a new coffin and new clothing are provided, the bones are washed with wine and carefully laid in order on the new clothing, the lid is laid on the coffin, and the coffin is covered with dirt. This is an old Chinese custom in Fukien and in Kwangtung.

Most of these people speak Chinese as well as the Miao language, but up until recent years they had no writing of their own, and very few, if any, of them could read or write Chinese. Their traditions and folktales have been made into poetry and, as songs, are sung by individuals who have learned them; thus they are handed down from generation to generation.

The language of the Chinese in southern Szechwan and in Yunnan has five tones and is monosyllabic and tonal, whereas the language of the Ch'uan Miao, which is also monosyllabic and tonal, has nine tones.

The Ch'uan Miao have no tribal organization that includes the whole group. They have local rulers called *gü leo* or "old clubs," and sometimes several local rulers cooperate temporarily for the good of the people. If they are a tribe, it is only because they have a common language, common customs, common ideals, and a strong sense of unity.

All the Ch'uan Miao are farmers. They are on occasion carpenters, blacksmiths, masons, or priests, but all depend primarily on farming for a living. Tools and farming implements are the same as

those of the Chinese, the most important tools being the hammer, ax, hatchet, saw, plow, sickle, and hoe. Most of them are made by Chinese blacksmiths and sold in Chinese markets.

Travel and transportation are generally on foot. People walk through the fields and over mountain paths and roads to visit their friends, and to towns and marketplaces. Loads are carried on their backs or at the ends of carrying-poles. They have few horses or mules, and these are generally used for riding.

The domestic animals are dogs, pigs, cattle, water buffaloes, horses, mules, sheep, goats, chickens, ducks, and geese. Every home has one or more watchdogs, and there is a special breed of hunting dogs. Water buffaloes are generally used to plow in rice paddies, and cattle on dry land. Much of their land is so steep that it can only be cultivated by the hoe. The sickle is used to reap crops, to cut grass, and to cut down small bushes and trees. The ax is used on large trees.

The Ch'uan Miao do not have stores or markets. There is considerable barter, but many of their commodities are bought and sold in the Chinese markets. Going to market is both a social and a business affair.

Some rice is grown on low, level ground where there is plenty of water for irrigation, but the main product is maize. Other farm products are fruit, vegetables, pork, beef, mutton, chickens, ducks, and geese. The principal food is maize ground into meal and boiled. It is eaten from bowls with chopsticks, like rice, and is generally mixed with vegetables and meat. The more prosperous Ch'uan Miao eat rice part of the time.

Many Ch'uan Miao houses have floors and walls of pounded clay and roofs that are thatched. Some are built of wood and have tile roofs. Other houses have walls of bamboo covered with plaster. The poorest have walls of cornstalks and roofs of straw.

The family is the social unit and is patrilineal. Marriages are made not by individuals, but by families through go-betweens. Land, houses, furniture, domestic animals, tools and utensils belong to families instead of individuals. As soon as a woman marries, she belongs to the family of her husband, for a family includes all men and their wives, their sons, and their unmarried daughters.

People having the same family name cannot marry, for even if there is no blood relationship they are regarded as relatives. There is also a feeling of relatedness between all Ch'uan Miao, so that to some extent they are all brothers and sisters.

The main amusements of women and girls are gossiping, making

love, going to market, attending feasts, funerals, and memorial ceremonies, listening to a man or a woman sing folksongs, and watching men dance and play the *liu sheng*. Amusements of men and boys include the above, playing blind man's buff, kicking the shuttlecock, sham battles, "snake protecting her eggs," dogs chasing wild animals, and hunting. At New Year time and at weddings all enjoy watching three men "playing lion." The Ch'uan Miao have no theatricals, but enjoy watching Chinese theatricals in Chinese towns and villages. There is little gambling but a great deal of lovemaking among the Ch'uan Miao. Generally it is not between a man and his wife, but between a man and another man's wife, or a woman and another woman's husband.

I have found no trace of the couvade among the Ch'uan Miao. After the birth of a child a mother must remain in her home for at least 30 days, or it is believed that calamities will ensue.

The common belief is that the Ch'uan Miao inhabit the high, steep mountains because they prefer to do so. This is a mistake, for their folktales reveal the fact that they dread the steep paths and high mountains and live there only because they are a defeated people and have not been allowed to live on the more level and more fertile lowlands. Their heaven is called *Ntzi ni lou gou bih*, or the ancient level land of Ntzi (god). There it is level, with no steep mountains to climb.

The Ch'uan Miao have no organized religion, no temples, no celibate priests, and they make no images of their gods. They completely reject the Chinese gods and their images, and their folktales intimate that harm comes to the Ch'uan Miao from worshipping them. They have a supreme god called Ntzi, but there are no ceremonies to worship him. They say that he is a good god and will help them without gifts and ceremonies of worship. This god is sometimes called Ntzi-nyong-leo, which means god, foundation, old, and seems to designate the ancient god who is the foundation of the universe. He has a daughter whom he sometimes sends to help a poor man by becoming his wife.

There is an immortal called Yei Sco, Yeh Seo, or 3e Sco. He is very wise and kind and will always help people who are in trouble by giving wise and kindly advice. He can make himself visible or invisible and is often seen near a cloud into which he may disappear. He is not worshiped. A female deity called Ts'i-ma-niang-tsai is very compassionate and is merciful and helpful to unfortunate children.

A warty toad called in Chinese Lai-ke-pao has supernatural power

and sometimes causes hail. When a hailstorm occurs, the people fire off guns to frighten the warty toad, believing that this will stop the hail from falling.

In some homes there is a family god representing the ancestors. It consists of a string of spirit money, hung up by the *tuan kung* or sorcerer in the center of the rear of the front room, on which he has sprinkled some chicken blood. It is an imitation of, and a substitute for, the Chinese house god on which is written the words, "The throne of heaven, earth, rulers, relatives, and scholars." The main door of a house is worshiped as a god. Behind closed doors and in secrecy a pig is killed, and offered to the door in worship. In this ceremony, if a single word of Chinese is uttered, the whole ceremony must be repeated.

A dragon king, who lives in a palace under a lake, causes rain. He also has a daughter whom he sometimes marries to a poor man to help the man prosper. Certain evergreen trees such as the *nan mu* that grow on hills or mountains are worshiped as gods, but never a fir or a pine. It is believed that this worship causes the crops and the domestic animals to prosper and sometimes heals diseases.

There are three great demons or devils. One is *glang gü*, who causes people to drown. A second, *glang-da-lo*, is so large that he can step from one mountaintop to another, or from the earth to the sky. He can strike a person dead with one blow of his thumb. *Glang-do* or *glang-ndo* is a sky demon. In his worship a sow is killed and offered, after which the demon is expected to disappear.

The Ch'uan Miao believe that all diseases and other calamities are caused by demons. Therefore the exorcising of demons, either driving them away or controlling them, is a very important matter, and this task is assigned to a special person—a geomancer. He is called in Chinese a *tuan kung* and in Ch'uan Miao *do nun*. I have witnessed his ceremonies and taken motion pictures.

At times during these ceremonies the *tuan kung* beats a brass gong and repeats incantations. Occasionally he says "pfit" and spurts water out of his mouth. He burns spirit money as an offering to the demons and sits on a stool saying "duv, duv, duv, duv" for some time as he imitates the sound of the hoofs of the horse on which he rides down into hell. He uses an assistant who is called in Chinese a *ma chüeh* or horse's hoof because of his speed and vigor. This man is put under a spell, after which he leaps about with a hatchet in each hand, striking in all directions. If he kills an angleworm or a mouse or some other creature, this creature is regarded as a demon. After a

time the *ma chüeh* is released from the spell, when he is normal again. The *tuan kung* has ceremonies for expelling all kinds of demons and for healing many kinds of diseases.

A priest called in Ch'uan Miao a *mo* performs all funeral and memorial ceremonies. He is not a celibate, but a farmer who knows the ceremonies so well that he can perform them whenever necessary. He is often a father or an older brother in a family.

Funeral ceremonies generally last two or three days in summer-time and up to seven days in winter. Soon after a person dies, a man dances and plays the *liu sheng* for a while, accompanied by the ceremonial drum. Three times the priest calls upon the deceased to arise, taking him by the hand and trying to assist him. Then he kills a rooster, and the soul of the rooster leads the soul of the deceased to paradise.

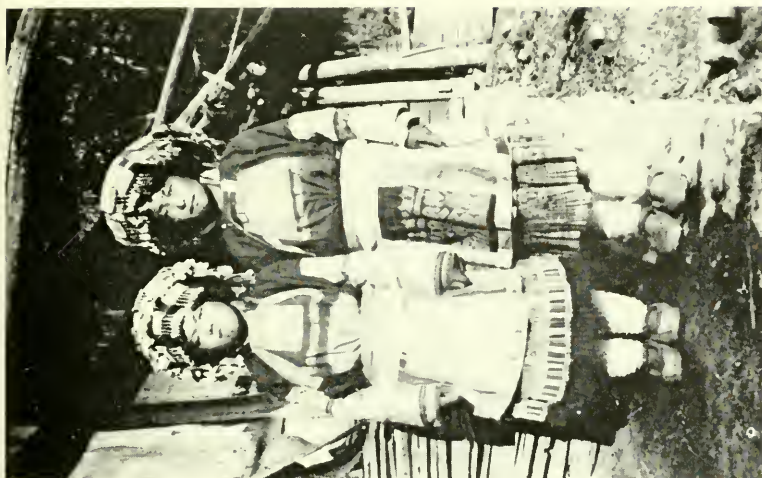
Some time later there is a procession in which one man marches in front twirling a stick. Two men sounding buffalo horns follow him, then two men carrying green bamboo twigs, and finally two carrying guns. This ceremony symbolizes ancient times when these people lived in deep forests where there were many dangerous wild animals, and the blowing of buffalo horns frightened away the animals that came to attack them. Later, a bull or a male water buffalo is offered alive to the deceased, then it is killed and the meat is cooked and eaten by friends and relatives at the funeral feasts. Generally on the next night after the bull is killed, a ceremony of dancing and pushing is participated in by the strongest young men. It takes place inside the house. Often the furniture is smashed, and it has sometimes happened that poorly built houses have been pushed over.

Twelve days after the funeral a memorial ceremony called in Chinese *sao ch'ieh* and in Ch'uan Miao a *shi* or a *si* is performed. On this day the spirit of the deceased is supposed to return and visit his home. His relatives sprinkle ashes outside the main door of the house and later look at the footprints in the ashes, for it is believed that these indicate whether the soul has been reborn as a human being, a horse, a cow, or some other creature. A rooster is killed and offered to the spirit in the raw state; then it is cooked, other food is added, and it is eaten by the relatives in a feast.

Some time later there is a ceremony called in Chinese *tso chai* and in Ch'uan Miao a *vang*. It must take place more than one year and generally two or three years after the *sao ch'ieh* ceremony. Friends and relatives march to the grave beating the drum and gongs and playing the *liu sheng* to entice the soul of the dead person back to



1. A Chi'uan Miao man, Mr. Yang Feng-chang, and his wife. He received a primary school education in a Christian school.



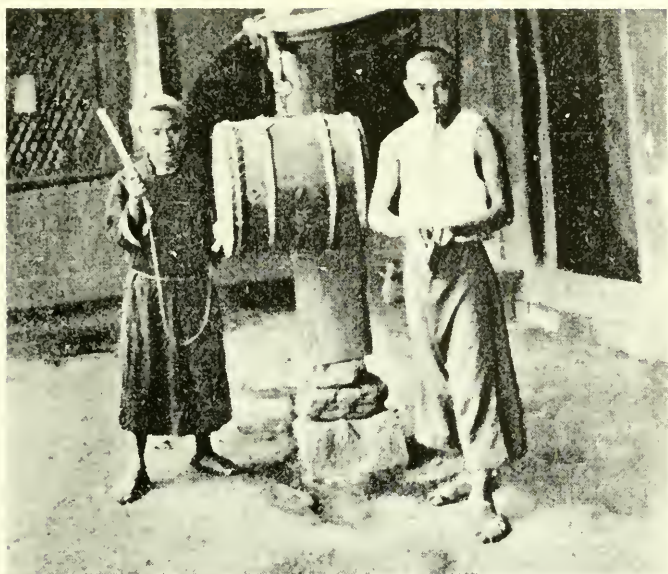
2. Two Chi'uan Miao girls from northern Yunnan, wearing finely embroidered clothing.



1. A Ch'uan Miao family, grandparents, parents, and children. The woman to right of center is wearing Ch'uan Miao embroidered clothes. Their home, in the background, has a straw roof.



2. Ch'uan Miao men and boys. The boys at the extreme right and left are students in Christian schools. The man in black is a grandson of a man who fought an unsuccessful war against the Chinese to free the Ch'uan Miao and make himself king.



1. A Ch'uan Miao *mo* or priest who performs funeral and other memorial ceremonies, beating his ceremonial drum and assisted by another Ch'uan Miao who plays the *lin sheng* and dances.



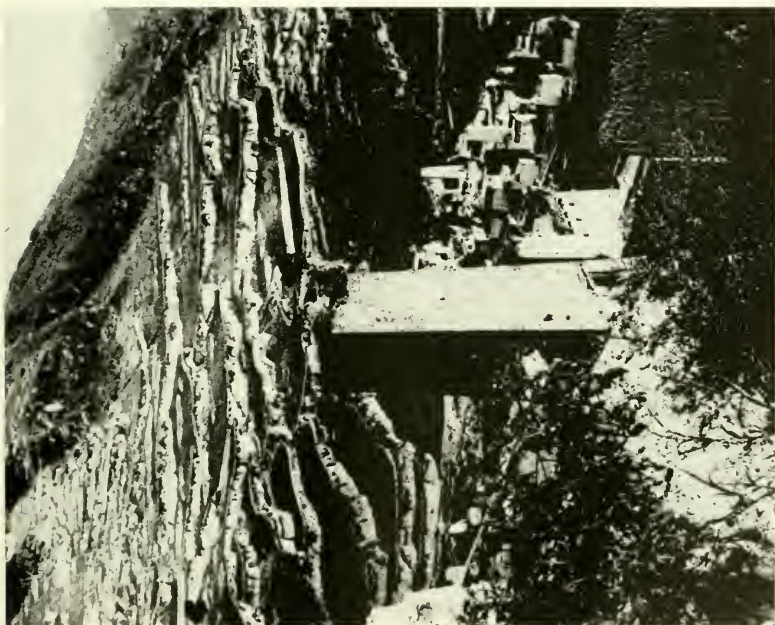
2. A Ch'uan Miao geomancer, called a *do nun*, about to begin a ceremony to exorcise demons.



1. Two Ch'iang priests at Ho-p'ing-chai, the one at the right in ordinary clothing, and the other dressed in his white robe, wearing his ceremonial hat, and holding his ceremonial drum.



2. A Ch'iang cremation house. During cremation ceremonies it is lifted up and placed at one side.



1. The Chi'ang village of Mu-shang-chai, showing flat-roofed stone houses, farms on the terraced hillsides, and a watch tower, the top of which was apparently shaken off by an earthquake.



2. The Chi'ang priest at Mu-shang-chai with his ceremonial hat and drum, and a lay leader who assists him in his ceremonies.



1. A Tibetan woman carrying water in a wooden barrel.



2. A Tibetan woman carrying a load of tea in Tatsienlu.



1. Shi Fan pilgrims in western Szechwan.



2. Wa-ssu hunters with guns and dogs near Wen-ch'uan, Szechwan.



1. A Chia-jung woman near Yao-chi in
Sikong province.



2. A Bo-lo-tzu man at Mao-chou, Szechwan.

his home. A cow or a water buffalo, or more rarely a pig, is killed, ending in a feast shared by relatives and friends. After the death of a woman, her soul has fastened on its back a large straw mat. In the case of a man, his soul has fastened on its back a large, round winnowing basket. These appendages are very inconvenient, for they make it impossible for the souls to enter the palace and join the spirits of their deceased ancestors. By this ceremony the obstacles are removed, and the souls happily join their ancestors in the level land of Ntzi.

Still later there is a memorial ceremony called in Chinese *ch'ao chien*, and in Ch'uan Miao *tsa mong*. This is the time when the bones are dug up and the coffin changed, the bones washed with wine, new clothing provided, and then the bones and the coffin reburied. It is assumed that the deceased ancestor has become very tired from lying in the same position and that this ceremony brings him comfort and relief.

Another very elaborate ceremony called in Chinese *hua t'an*, and in Ch'uan Miao *a gi bang*, is participated in by all who have the same family name. It is performed in one of the homes once in three years and lasts from one day and one night to three days and three nights. A bull is killed and the skin used to cover a new or an old ceremonial drum. Each family contributes its share of food, and the meat of the bull is cooked, ending in at least one feast and sometimes several.⁶

The Ch'uan Miao have the same lunar calendar as the Chinese, from whom they apparently adopted it. This includes lucky and unlucky days. Often a Ch'uan Miao simply buys a Chinese calendar and uses it. The calendar festivals correspond to those of the Chinese, except that the kitchen god, whom the Ch'uan Miao do not worship, is not ceremonially sent up to heaven on the 23d day of the 12th moon and welcomed back the night before New Year.

The Chinese calendar festivals occur on the 1st, 2d, 3d, and 15th days of the 1st moon, on the 3d day of the 3d moon, on the 5th day of the 5th moon, soon after the harvest to welcome the new grain, on the 15th day of the 7th moon, on the 15th day of the 8th moon, on the 9th day of the 9th moon, on the 1st day of the 10th moon, and on the 30th day of the 12th moon.

In all the funeral, memorial, and calendar festivals, when there is a feast, the deceased ancestors are expected to be present and to partake. Food and wine are offered to them. On the 15th day of the 7th

⁶ This account is very much abbreviated. For a full account see my article, "The Customs of the Ch'uan Miao" (1937b).

moon burned spirit money is provided for the deceased ancestors. It is believed that by burning paper spirit money, it is transformed into money that can actually be used in the world inhabited by the spirits of the deceased ancestors.

The earth is not regarded as flat, for there are too many high and steep mountains in the country of the Ch'uan Miao. All the deceased ancestors live for at least three generations in a paradise called the ancient level land of Ntzi. Below the earth is a land of dwarfs, called broom people because they are about as tall as a Chinese broom, or about 2 feet tall. There is also a land of demons.

It is believed that people change easily into water buffaloes, cows, tigers, foxes, monkeys, rats, snakes, fish, frogs, crabs, flowers, vines, and banana trees, and from these back into human beings. Most commonly people change into tigers, and tigers into men. Some change into evil tigers, but deceased fathers sometimes change into good tigers in order to help their sons. There is a witch called *bo ntsong* who bewitches people and changes them into tigers.

All inanimate objects are believed to be alive. The sky, earth, sun, moon, stars, mountains, rivers, rocks, trees, thunder, the rainbow, the echo, fields, plains, crops, swords, marriages, beds, the ceremonial drum, the *liu sheng*—all these and many other things are regarded as living, intelligent creatures. For instance, rocks are male and female, they grow, they can speak, and they have offspring.

The Ch'uan Miao find it difficult to affirm that inanimate things have souls, but natural and easy to say that they have lives, and that these lives are intelligent and active, and have eyes. They also find it easier to say that living creatures, such as cows, have lives than that they have souls. But the concept of the soul is well known and closely resembles that of the Chinese, from whom they evidently learned it. Dreams are regarded as actual experiences, and in dreams the soul leaves the body. The shadow and the soul are the same, so that it is worse for a mad dog to bite a man's shadow than to bite his leg.

To the Ch'uan Miao all nature is surcharged with a mysterious, superhuman potency. This is especially present in powerful human beings, in devils, gods, and other superhuman beings, and is manifested in charms, incantations, and religious ceremonies.

THE LOLOS OR NOSU

My first contacts with the Lolos began in 1913 when I was stationed at Suifu, now called I-pin, and appointed pastor of the Suiñu

Baptist Church. It was my duty to cover not only I-pin, but about 15 outstations, including Hsü-chiang and Man-i-ssu, which were not far from the Lolo region. The Lolos often came to I-pin to market, and there were Lolo hostages at P'in-shan, where I often met them and talked with them. In 1928 I was sent to Ningyuenfu and talked with some Lolos there, taking anthropometric measurements and observations. Near Fu-lin I lived a few days in the home of a friendly Lolo headman, who gave or sold me some of the Lolo artifacts, together with information about their customs. With the help of this Lolo friend the writer translated seven short Lolo sacred books. It is evident that this Lolo friend, who was a member of the Yachow Baptist Church, added some lofty ideas that were not in the original text. Among other things he informed me that the Lolos were monotheists, which certainly is not so.

Before and after the trip to Ningyuenfu I read all the available books and articles about the Lolos. I refrained, however, from writing about them, feeling that I must have more information in order to give a fair interpretation of their psychology, their social customs, and their religion. During World War II several Chinese who had been trained in some of the world's best universities spent months and even years among these people, with the result that several important articles have been published providing me with much-needed information. Among the best sources are the Lolo people's own sacred books.

The Lolos, or Nosu, live in the southern end of Sikang, in the southwest tip of Szechwan in the districts of Ma-pien and O-pien, in northern and western Yunnan, in western Kweichow, and in northern Indo-China. Their main culture center is Liang-shan, or Cold Mountain, in southwest Szechwan and in Sikang. Much of the territory inhabited by the Lolos is mountainous country, very steep and rugged, with only small footpaths for roads. Many of their "roads" can be traveled only on foot, and some are impassable for ordinary people.

The early history of the Lolos is still little known. One tradition is that they were the Lu who joined the Chou people under Chou-wu-wang and overthrew the Shang dynasty in 1121. One author states that in the Chou dynasty they were called Lu, in the Book of History the Wu-san-lo, in the T'ang dynasty the Lulu, or the Wu Man, and in the Yuan dynasty Lolo. Another tradition states that they are closely related to the Liao people, who were widespread in northern and central China in past centuries. It seems evident that

they migrated from more central parts of China westward through northern Yunnan. They do not like to be called Man-tzu or Lolo, but prefer the name I-jen, Noso or Nosu.

There are two castes of Lolos, the "blackbones" and the "whitebones." The blackbones are the purest Lolos and are the rulers and slaveholders. The whitebones, who are the slaves, are Chinese, Miao, Tibetans, and others who have been captured and enslaved. The blackbone Lolos are tall and brown in color. Their hair is black, their eyes dark brown or black, and their noses are generally higher and thinner than those of the Chinese. They belong to the Burma-Tibetan branch of the yellow race.

Their language, which is monosyllabic and tonal, with five tones, is classified with the Burma-Tibetan group. Owing to long separation between different "tribes," there is considerable variation in language between different ethnic groups. The language of the Lolos is said by those who have studied it to resemble that of the Moso or Nashi. I have noted a number of close resemblances in the vocabularies of the Lolos and the Ch'iang, which is confirmed by Prof. Wen Chai-yu, who has studied both languages. For instance, the Ch'iang say *sei* for god and the Lolos say *sii*. Both the Ch'iang priest and the Lolo priest are called *bi mu* or *bi mo*.

The walls of their houses are generally made of beaten clay, but sometimes of wood, bamboo, or stone. The roofs are often covered with shakes or long, thick shingles held in place by large stones. Sometimes the roofs are covered with tiles or straw. There are generally three rooms and often no windows. People sleep on mats of bamboo on the ground around the fireplace, which is sometimes simply a hole in the ground in the center of the room. Where Chinese influence is strong, the stove is made of clay and stones or bricks. Generally the only covering used when sleeping is the thick felt cloak worn by most men and women. Many of the houses are on mountainsides, but some are on level places or plains. Small villages have as many as 20 or 30 houses.

Of almost any ethnic group in West China it can be said that the principal occupation is farming. Of the Lolos in the Liang Shan region it is said that their main occupation is the pasturing of flocks, particularly of sheep. There is some cultivation of wheat, maize, buckwheat, oats, barley, rice, potatoes, sweet potatoes, and other vegetables, and the domestic animals are cows, sheep, horses, donkeys, water buffaloes, dogs and cats, and chickens, ducks, pigeons, and geese. Next to pasturing and farming the main occupation is hunt-

ing wild animals, which are fairly abundant. Nearly every Lolo man is a hunter at least on occasion. The women weave cloth and make felt clothing, carry water, work in the fields, cook the food, and do many other kinds of hard work.

Their main food consists of the grains and vegetables listed above and the meat of wild and domestic animals, including horse meat. All kinds of meat are often eaten raw or half raw. Their implements are the usual plows, hoes, sickles, hammers, saws, and others. For fighting purposes they use knives, swords, and guns. In former times they wore leather armor and used poison arrows when fighting and were noted for the use of spears with long handles, which enabled them to injure an enemy while they themselves were out of reach of the enemy's weapons. They now use modern rifles which were traded to them for opium and other commodities.

The art of the Lolos is simple and sometimes crude. There are no images of the gods, but sometimes pictures of the gods are drawn or carved on pieces of wood used as charms or in sacred books. One has to use his imagination to see the resemblance to a human being. Designs in black, red, and yellow are painted on wooden food bowls and on wine jugs, and in former times they were drawn on leather armor, shields, and quivers. Women's clothes are sometimes decorated with embroidery.

Society is strictly divided into the aforementioned castes, blackbones and whitebones, and the caste distinctions are very strictly enforced. If a blackbone woman marries a whitebone man or has sexual relations with him, the penalty is death. If a blackbone man marries or has sexual relations with a whitebone woman, he must pay a heavy fine. This is to protect the purity of Lolo blood. There are about nine whitebones to one blackbone, so that the latter are comparatively few. Society is also divided into tribes, clans, and families, always in accordance with heredity from some common ancestor and blood relationship. Those living in the same district may all have the same family name. In the Liang Shan region some live at least temporarily in natural caves. There are chiefs or heads of tribes, clans, and families.

Among the Lolos the family and blood relationships are looked upon as very important. Generally the families are patrilineal, but sometimes descent is reckoned through the mothers rather than the fathers. Marriage is commonly arranged by go-betweens, and a large gift or bride-price is paid the parents of the bride. Marriage by capture is often practiced, but it is by prearrangement. The relatives

of the bride take her to the appointed field, where the groom and his friends come and capture her and take her away. Probably this goes back to real marriage by capture in earlier days. In case of divorce caused by the bride and her relatives, the bride-price is returned to the family of the groom. Women are quite precious, so that the groom and his relatives are not likely to bring about a divorce. The reason given is that when women are irritated they may commit suicide, whereupon the groom and his family must pay to the wife's mother, and generally in addition to the grandmother on her mother's side, a sum of money or make a gift equal in value to the original bride-price. Lolo women are well treated.

Family or clan feuds and intertribal wars are very common among the Lolos—an injury must be revenged. Cruelty and bravery are much admired. Every man carries a knife or a sword if possible, and a gun if he possesses one. Without weapons a man feels very unsafe. Any time of day or night his enemies may surprise and kill him. Robbing, and especially robbing the Chinese and taking them captive, is a respected occupation.

Disposal of the dead is by cremation and takes place in one of the sacred groves. The trees of these sacred groves can be used only for cremation. The body is burned to ashes with elaborate rituals, and then the ashes are covered with dirt, making a small mound. During each funeral ceremony a cow or a sheep is killed and offered to the gods and spirits, then eaten by the mourners and guests.

The *bi mu* or *bi mo* is a priest, wizard, and wise man. Among the Lolos he is regarded as an educated person and an official who understands the sacred books and can read Lolo characters, and also understands religious doctrines, ceremonies, and magic. He becomes a teacher and passes on his learning to pupils who in turn become *bi mus*. The word *bi* means doctrines, learning, moral principles, and religion, and *mu* means old. The two words mean old man who understands moral and religious doctrines, teachings, and sacred books. Sometimes they are called by the Chinese *Tao Ssu* or *Mien Ba*, meaning Taoists, shamans, or fathers of black magic. In short, they are scholars of hidden mysteries which have been handed down from generation to generation.

The work of the *bi mu* includes repeating the sacred books, teaching future *bi mus*, exorcising demons, healing diseases, bringing peace and prosperity, divination including the determining of lucky and unlucky days and the fortune or misfortune to be expected in certain occupations or undertakings, fortunetelling, performing cere-

monies to injure others by magic, repeating incantations, and performing ceremonies to counteract black magic.

The *su t'o* or *su nieh* or *su Gnie* is a magician who does not read or repeat sacred books. He is a common person and is not taught by another *su t'o*. The demon of some dead *su t'o* takes possession of him, or of his body, after which he sacrifices a white sheep or rooster and is healed, thereupon becoming a *su t'o*. Each *su t'o* has a protecting god, but has also the help of many gods. He has no sacred books, and his only sacred instrument is a sheepskin drum. During his ceremonies he beats the drum and chants incantations. His whole body trembles, and he turns round and round, dancing and jumping. The god possesses his body, and he speaks the words of his god. Another person takes a forked stick and follows him, also turning round and round. Most of the *su t'os* are male, but some are women. They heal diseases by exorcising the demons that are believed to be the cause of all diseases, and they break the black and deadly magic of one's enemies. During the ceremonies they kill chickens, sheep, or cows as sacrifices, and beat a drum. They also sometimes lick red-hot irons with their tongues and tread on red-hot plowshares with their bare feet, or dip their feet into a bowl or pot of boiling water. After the ceremony the drum is hung up in the forest to show that the god is no longer present. One of their remarkable feats is to ascend and descend a ladder made of 36 swords whose sharp edges are upturned, which is done barefoot after praying to the gods for protection. First the *su t'o* goes over three red-hot plowshares, then over the ladder of sharp swords, and he is generally unhurt.

The *hsiang ssu*, most of whom are women, are fortunetellers or palmists. They look at one's palms and from the lines tell whether one's future will be lucky or unlucky, how many children a family will have, and many other things about the future.

Among the Lolos the sacred books are very precious and must not be permitted to lie around. They are also secret, for only the *bi mus* can understand them. The paper they are written on varies in different localities, and they are generally written with a pen cut out of wood. They are generally written in short sentences, the rhythm being very harmonious. One writer asserts that they are written in exceedingly good verse form. Their contents may include the calling of the gods, oaths, charms, incantations, ceremonies to open the way of the soul to Hades, sacrificial ceremonies, prayers, exorcising demons, and ceremonies of magic to injure people, to counteract black magic, to insure good crops, of thanksgiving, to pray for rain, and

other ceremonies. Only the *bi mu* understands, can read, and repeats the sacred books.

Among many primitive tribes, thunder and lightning are gods or the actions of powerful gods. The same was true in pre-Christian days in northern Europe, when Thor, the mighty thunderer with a magic hammer, caused thunder and lightning. There was supernatural power in his hammer, so that when an enemy had stolen it, Thor was helpless and could not conquer his enemies. Among some ethnic groups this mysterious power is assumed but not named, as seems to be the case with the Ch'iang and the Miao. Among the Chinese it is *yin-yang* and *fengshui*. Among the Polynesians it is *mana*, and this word has been accepted throughout the world as the scientific name for this strange, uncanny, mysterious, supernatural power. Dr. Yen of Yenching University has written an article on the religion of the Lolos in which he describes this idea among them and says that they call this power *gi-lo*. Among the Lolos the gods are believed to possess this power, as do also the demons and the priests or shamans. It can be utilized to help or to harm people. Used rightly it is beneficial, but if used wrongly it can do much harm to one's self or to others. Hence there are charms, incantations, and ceremonies to make use of this power. It can be used for almost any purpose—to cause rain, to insure good crops, to obtain sons, to cause the domestic animals to prosper, and to injure or kill one's enemies.

Closely related to this concept is that of taboo, with numerous prohibitions. It is the idea and the practices growing out of it that certain things must not be done, for serious consequences might result. There are lucky and unlucky days and years when everything is likely to go well or wrong. It is unlucky for a person to get married on even years—he or she must get married on uneven years, at the age of 13, 15, 17, or the like. A Lolo is hedged about with taboos from the day of his birth to the day of his cremation. Among many taboos are the following: One must not touch the knot on a man's head, which is called *t'ien p'u-sa*, or the shy god. Vegetables must not be fried in oil because demons like the smell of oil and might be attracted by it into the house. A saddled horse must not be led into one's house or courtyard, or saddled inside a house. It is unlucky for an old hen to lay an egg and then eat it, for a chicken to fly or to crow during the night, for a hen to crow, for a hunting-dog's tail to wrap around a bush or a tree in the forest, for a wild bird to fly into the house, for a crow to caw in front of or above the house, for a rat to fall into a water jar, for a frog to come jumping into a house,

for a snake to come in front of or into a house, for a spider to spin a web inside of a house, for a person to see a snake swallowing a frog, and many other things. A complete list of taboos would be a very long one.

It is quite natural that charms should be much esteemed and used by the Lolos. In 1929 I obtained several Lolo charms, seven of them for exorcising demons and five for praying for or producing rain. These charms consisted not of characters or of pictures of gods or of demons, but of strange designs drawn on paper or cloth. Some Lolo charms are made of wood on which are drawn pictures of gods or demons. Charms are sometimes hung up above the front door to prevent the entrance of demons. Others are hung up beside or on the altar, or are hung or pasted up inside the room of a sick person, or pinned on a sick person's pillow, or pinned or sewed on a person's clothes, or burned so that the ashes fall into a bowl of water, the water to be drunk by the patient.

Incantations are a part of almost every ceremony, and are thought to be very potent. There are two ways for people to fight or carry on a war: One is openly, with fists or with weapons, and the other is by black magic. Incantations are a part of a magical method of attacking an enemy and of putting him or her to death. For instance, when two women quarrel and fight, one may tear out some of her enemy's hair or tear off a piece of her garment, and taking it home, repeat incantations over it and bury it, or stab it with a knife. As a result her enemy dies unless she uses countermagic, in which incantations also have a prominent part. In more important ceremonies of countermagic, cattle, dogs, sheep, or chickens may be sacrificed, and sometimes "several tens" of them. Sometimes the Lolos take the bone of a monkey, or of a horse that had scabs on his head, tie straw around or on the bone so that it represents a person, repeat the name of the enemy, and also repeat incantations. Then the bone is sent to the enemy's home or buried in a field near his home, and the enemy dies unless there are ceremonies of countermagic with incantations. Sometimes a musk deer or a pheasant is caught, incantations are repeated over it, and it is released so that it will run or fly toward the enemy's home, when the enemy will die.

Very important also are the ceremonies to counteract black magic. They include numerous incantations, for these are sincerely and deeply believed in as efficient means of making use of the mysterious supernatural power generally called *mana*. It is generally the *bi mu*, but occasionally the *su t'o*, who conducts ceremonies to counteract black

magic, or, as the Lolos say, to break the effects. If the ceremony is not performed, then the person against whom the black magic is directed will surely die. But if the effect is broken by countermagic, the person is saved.

Before each important activity and affair the Lolos divine to learn whether the outcome will be lucky or unlucky, good or bad, and to learn the will of the gods. Fights, wars, journeys, engagements, marriages, diseases, burials, memorial services, strange dreams and visions—these and many other matters are occasions for divination. The methods of divination are numerous and sometimes complex. They include the use of animal bones, roasting the leg of a sheep, using wood, beating carved wood, beating chickens to death, examining chickens' eggs, examining the ribs of pigs, consulting the sacred books, counting bamboo sticks, chewing rice, rubbing eggs, and the use of the *yin-yang-kua* or the two halves of a bamboo root, so common among the Chinese. Sometimes the shoulderblade of a sheep is used, a very old custom found among the Chinese of late Neolithic times.

The Lolos have numerous ceremonies connected with funerals of cremation, commemoration of the dead, praying for rain, healing diseases by exorcising demons, cleansing homes of demons, and preparing for battle.

A goodly number of the authors who have written about the Lolos have asserted that they are a simple-minded people and that their psychology is very primitive. We find many evidences of this. The sun, the moon, rivers, mountains, and many other inanimate things are regarded as living, sentient beings that can talk, marry, and have children. These, along with trees, rocks, animals, and insects are often regarded as gods. There are magical horses that in an incredibly short time fly up into the sky or cover long distances from one place to another. Men and gods have marvelous powers. Thunder, rain, hail, and the wind are great beings that are regarded as powerful gods.

In northern and central Yunnan the Lolos have had much contact with Chinese religious leaders, and this has had an effect on their religion. Evidence of this is found in their lists of the gods. In his book, "The Shamans and Sacred Books of the Yunnan Lolos," Mr. Yang Chen-tzu gives a list of 46 Lolo gods and identifies them all with Chinese gods, such as Yü Huang, Shen Nung, and others. Other authors give longer or shorter lists of the more distinctly Lolo gods in the Liang Shan or Cold Mountain and nearby regions.

A Lolo friend who lives near Fu-lin gave me the following list of gods, which is evidently not complete. One is Mu Mi, which means the sky, heaven, or the sky god, like the Chinese word Heaven. The entire name is Mu-mi-shi, the word *shi* meaning god. Some Lolos think that he rules the other gods and so is supreme. Wa Se is a god of the house, or a house god, and there are many of them. Mi-er-mi-shi means god of the mountains, and there are many of them also. Another Lolo friend gave me the name of a god who, he said, was a messenger between gods and men. Lin Kuang-tien, a local Lolo ruler or headman near Yüeh-sui, who has written at least two small books in Chinese about the Lolos, gave me the name of a creator god, A-p'u-gga-sa, a sky god named Mong-mu, and a mountain god named Mur-mi-si.

A very interesting book is "A Study of the Lolo Manuscript Sii-seo-bo-p'a, the Origin of the Gods from the Liang Mountain," by Fu Mao-chi (1946). The following is a quotation from it:

To the mind of the Lolo people the distinction between gods and other beings (animate and inanimate) is not strictly observed. Therefore the Chinese official Chu-ko Liang of the Han dynasty and some native chiefs in olden times such as Lo-p'u-sho-to'y have been regarded as gods. Horses, insects, plants, the sun, the moon, and the Golden Sand River have also been gods or the relatives of gods (text, 16, 26, 127, 131, 135, 139). The Lolo word for god is Sii Zeu which originally meant "the son of knowledge or of wisdom." There have been pictures of gods but no idols in the real Lolo religion. The divine beings are not represented in human form, although in time good and powerful men can develop into gods. This text states that the mother of the sun and the moon had nine feet, nine hands, and nine eyes. The picture of the god Chih-keo-a-rl at the end of the text is somewhat like a frog.

The Lolo people still think that the world is not only filled with gods, but also with demons. The former are benevolent but the latter harmful. In order to ward off the attacks of the demons, they have many prohibitions or taboos. These taboos control the actions of the Lolos during religious ceremonies as well as in daily life. When they happen to violate the taboo, they think that the demon or demons will come to their home. For stopping or driving out the demons they have to ask the *pi mo* (monk) to recite incantations or the *su gnie* (wizard) to charm by sorcery. This manuscript gives the names of about ninety gods and goddesses.

In an unpublished manuscript by Cheng Chung-hsiang, from which I am permitted to quote, there is an extensive study of Lolo religion and culture, giving the mythological history of many of the Lolo gods and demons. These Mr. Cheng classified as follows:

1. Nature gods. There are many mountain gods, for every mountain has its god. There is also the thunder god, the sun god, and the moon god, meaning that the sun and the moon are gods.

2. Strange-form gods. These include what he calls a chicken-claw god, with the upper part like a man and the lower part like a chicken; Uncle A-pu, who has a beard 7 feet long and can cause wind by blowing hard; A-ta-la-nieh, who is so tall that his head touches the sky; the noise of his whistle is as loud as thunder. There is a god who is the son of an eagle, sometimes identified with Lung-yin-hsiu-ts'ai, famous among border tribes, and said to have been born in Tzu-tsou. Miraculously born as the son of an eagle, many are the marvelous deeds that he performed. The Lolo story says that there were nine suns and nine moons, which so scorched the earth that all vegetation and all vegetable and animal life were threatened with extinction. With his bow and arrows he shot down eight suns and eight moons, and the ninth sun and the ninth moon retreated and hid, so that for a long time all on earth was dark and gloomy. The legend tells how later they were persuaded to come out again, the sun by day, and the moon by night on half the days of a month. He also captured and tamed the god of thunder. Another god is Ch'u Nieh, the ancestor of the *bi mus* or priests. Numerous other gods are mentioned.

This author also names many different demons, which he also divides into three different classes: First, demons who died by unusual deaths, such as drowning, being struck by rolling stones, from swooning, from the overturning of boats, from falling over cliffs, from pain in the abdomen, or of women who died in childbirth. Second, curious-form demons, such as demons of chickens who had double heads, of a man who died and turned into a leper-snake, and the demon of a man who turned into a chicken. Third, curiously acting demons, among them begger demons, for the Lolos have no beggars and regard beggars as very curious; demons who eat human beings; and demons of long-tailed chickens who can fly.

The stories, myths, legends, and folktales of any people are of great interest because they throw much light on the social and religious ideals and customs of the group. The following are two folktales of the Lolos:

1. *The flood*.—Two brothers were cultivating a field. Every day with their hoes they would turn the soil over, and every morning when they returned to their work they found the soil turned back as it had been before. They finally decided to watch during the night and see what was happening. About the middle of the night they saw an old man turning the soil back as it had been before. The older brother wanted to beat the old man, but the younger brother urged that they first ask him for the reason of his conduct. The old man said, "The

world will soon be flooded and every person drowned. You had better make a plan to save yourselves."

The older brother made a boat of metal, and the younger brother made a boat of wood. When the flood came, the older brother was drowned, and only the younger brother and his sister survived. Unless they married, the human race would become extinct. But the girl was not willing to marry him, because it was not right for a girl to marry her brother. They resolved to divine to learn whether it was the will of the gods for them to marry. They therefore took two parts of a stone grinder and rolled them down a hill. If they should be together when they stopped rolling, the brother and sister should marry; if apart, they should not marry. The two parts of the grinding-mill were rolled down the hill, and they stopped together. Therefore the brother and the sister got married, and the human race was continued.

2. *The first human ancestors of mankind.*—In ancient times there was a family named Ch'iao-mu-chia, in which were three brothers. The name of the first was Ch'iao-mu-shih-ch'i; of the second, Ch'iao-mu-shih-li; of the third, Ch'iao-mu-shih-ch'i or T'ao-mu-shih-liao. Their profession was farming.

Once the three brothers plowed a field continuously for three days. They started work at daybreak and stopped at dusk. They worked very hard to plow the dirt soft. Every morning they found the soil turned back again and hard as though it had not been plowed. They were astonished at this. On the fourth night the three brothers watched the field to see what would happen. At midnight there was a sound as though somebody was plowing. The three brothers were surprised and woke up. They saw an old man with a long white beard, holding a big hoe. The two older brothers thought it might be a demon. One jumped up and pulled out his sword. The other placed his arrow on the bow. They intended to kill the old man, but the younger brother came up and prevented them. He went to the old man and asked the reason for what he was doing. The old man said, "All creatures have offended the gods and the demons. Therefore seven days after this there will be a great flood that will destroy all the creatures on the earth." Then the younger brother knelt before him and entreated him to save them. The old man said to the oldest brother, "You make an iron boat and put all your possessions in it." To the second oldest brother he said, "You make a brass boat and put your food and other possessions in it." Finally he said to the youngest, "You make a wooden boat of the wood of the *wu-t'ong*

tree, and put all your possessions in it. Put into it a male and a female of every kind of bird, animal, insect, or worm. On the seventh day let each of you brothers get into his own boat." Then the old man disappeared.

Each of the three brothers did as he was ordered, and prepared his boat and his things. Seven days later there was a great flood, and in a short time the earth was a great ocean. The iron boat of the oldest brother and the brass boat of the next to the oldest, with all their possessions, sank to the bottom of the ocean. Only the wooden boat of the youngest brother floated on the misty and turbulent waters. The youngest brother did not know how many days and nights passed. Finally his boat stopped on the top of a mountain that had not yet been covered. This mountain is called Su-lo-bu in the Lolo language, which means that this is the home of the otter. (The place is between Chao-gioh and Lei-po, and is called in Chinese Dragonhead Mountain.)

Then the youngest brother got out of the boat and rested on top of the mountain. He broke an arrow and made a fire of it for smoking and to warm himself by. With his hands he rescued from the water the crows, snakes, bees, frogs, and other creatures that were floating on the surface of the water.

Eighty-one days after the flood the T'ien Kung or King of the Sky sent a messenger to investigate the earth. The messenger returned and reported that the whole world was inundated, and that only the top of the mountain called Su-lo-bu was visible, but that it had a dark, smoky appearance. The King of the Sky thought, "It is Shih-ch'i, of the Ch'iao-mu family." The Mother of the Sky wanted to destroy completely the human beings, but the King of the Sky thought that if only one person lived it would not make much difference.

During that time the creatures that had been rescued were dancing and singing, rejoicing over their rescue, on top of the mountain Su-lo-bu. Only the crows retreated to the edge and stood silently and sadly. The frog knew that the crow had eaten the ashes of the sky book, and that therefore he had foresight and cleverness. The frog therefore jumped in front of the crow and inquired about the matter. Then the crow announced to all of them that the King of Heaven intended to make the water rise to the sky, for he planned to destroy all creatures. The Mother of the Sky would not prevent him, and the King of the Sky intended to destroy every living thing. Therefore all should cease rejoicing and think out a plan to save life. They

discussed the matter very earnestly. Then they elected the snake to ride on the goose, and the frog to ride on a bird, to follow the crow and the yellow bee and to fly up into the sky, to carry out the plan they had determined upon to save life.

On the morning of that day the Sky Mother had just gone out of the door of her palace. There was a yellow bee which buzzed and stung her hand. Then she turned back to the water jar and stretched out her hands to wash them. A poisonous snake came out from under the water jar and opened its mouth and bit her. The Sky Mother immediately fell down on the ground and fainted. Because of the poison, her leg swelled larger and larger. Then the King of the Sky and all the people in the palace were frightened stupid. The daughter of the King of the Sky was especially very sad.

Suddenly from the rear of the house the croaking of the frog was heard. The King of the Sky asked, "What is this?" An old servant answered, "It is the frog croaking." The King of the Sky knew that the frog could heal the wound caused by the snake bite. He was about to send a person to invite the frog when the frog leaped through the window. He examined the Sky Mother once, then talked with the King of the Sky about her illness. He said, "This illness is very serious. If you want it cured, please promise me a reward." The King of the Sky said, "That is very easy. You may have gold, silver, and precious things as you desire." The frog shook his head and said, "I do not want these things at all." The King of the Sky asked him, "What do you want?" The frog looked at the daughter of the King of the Sky and said timidly that all he wanted was the king's daughter to be married to Ch'iao-mu-shih-ch'i. The King of the Sky thought about it for a while and then answered, "Go ahead and treat her quickly. After the disease is cured, I will urge her to marry him." The frog jumped in front of the Mother of the Sky, and was about to treat her. A servant girl was nauseated by the frog and scolded him. This made the frog very angry. He was also afraid that the King of the Sky would not keep his word. He therefore asked the King of the Sky, "Please answer me honestly as to whether you promise or not." The King of the Sky answered him deceitfully. He said, "We may talk about it again after you have cured her." The frog then jumped back toward the King of the Sky and said that the disease was very serious. "I am going away now," he said.

Then the daughter of the King of the Sky became anxious. She could not endure it, for her affection for her mother was very deep. She then said bashfully, "You treat my mother's illness quickly. I am

willing to be married to Ch'iao-mu-shih-ch'i." The King of the Sky also said, "That is all right. I promise to give her to him." Then the frog ceased worrying and leaped in front of the queen to cure her disease. The crow left the palace and flew back to Su-lo-bu to report the cheerful news.

The time passed very quickly. Ch'iao-mu-shih-ch'i was married to the daughter of the King of the Sky. For years there were abundant harvests, and all the people were happy. But the three sons of the daughter of the sky could not talk. They could only eat and do mischief, like three dumb people. This made their parents sorrowful.

A small yellow sparrow was anxious to reward them for saving its life. He flew here and there seeking a method to requite the young people. One day he arrived at the palace of the King of the Sky. He heard a moth say that the three boys could speak if someone would get and use three joints of bamboo (causing them to explode by putting them in a fire). The yellow sparrow was very happy. He suddenly said out loud "I know, I know." The Sky Mother immediately sent a person to catch the yellow sparrow. The yellow sparrow flew away, but an angel (messenger) caught the tail of the yellow sparrow and it was broken off. Therefore sparrows now have short tails.

The little sparrow returned to report the good news. They sought out three joints of bamboo and burned them. The bamboo joints exploded loudly, and the three dumb boys were so surprised that they cried out. The oldest boy said in the Lolo language, "This is very hot." The second oldest shouted in the Hsi Fan language, "This is very hot." The youngest also shouted in the Chinese language, "This is very hot." They became respectively the ancestors of the Lolos, the Tibetans, and the Chinese, and so of all human beings.

The minds of the Lolos are so simple and primitive, comparatively, that almost anything may be taken as a god. One writer states that after death nearly every human being becomes a god or a demon. If he is good he becomes a god, and if he is bad he becomes a demon. The demons are very numerous and are greatly feared. There are many ceremonies of exorcism. Demons and gods have supernatural power, as do also the priests or shamans. Gods are helpful provided they are respected, worshiped, and sacrificed to, and the demons do harm. There are numerous ceremonies and incantations to obtain magical results, and ceremonies to break the power of evil magic.

Politically and socially the Lolos have long been a difficult prob-

lem for the Chinese and other neighboring ethnic groups. This is partly because of the high and rugged mountains which make it difficult for an army to penetrate, partly because of their fierce bravery, and partly because the Lolo society is founded on a system of slavery. Until this slavery is overthrown or changed, the problem will never be solved. When there are no longer any slaves, the Lolos may become a much less significant tribe or ethnic group on the borderland, for the slaves are not really Lolos, and the "blackbones," or pure Lolos, comprise approximately only one-tenth of the population.

THE CH'ANG

The Ch'iang live in the highlands of western Szechwan on the T'o, or Tsa-ku-nao, and the Min Rivers. Their home is between Tieh-ch'i on the north and So-ch'iao on the south, and from a few miles east of Wei-chou and Mao-chou on the east to P'u-ch'i-kou, 20 *li* up the Tsa-ku-nao River from Li-fan, on the west. Their country is one of steep hillsides, narrow valleys, high mountains, and rushing mountain streams. They number, probably, between 50,000 and 100,000 people. The country is semiarid, and occasional droughts and failures of crops bring much hardship to the people. There are also occasional earthquakes and floods.⁷

References to the Ch'iang can be found in the earliest Chinese histories. It is stated that Shun found the San Miao so refractory that he banished them to western China, and some recent Chinese scholars believe that the San Miao were Ch'iang. There are many references to the Ch'iang on the oracle bones, which are dated during the Shang dynasty, 1401-1121 B. C. Under pressure from the Chinese, some moved westward into Kansu, while others turned southward into northern and western Szechwan. At one time they extended beyond Sungpan into Kansu on the north, and to Yüeh-sui, southwest of Yaan, on the south. Now they are confined to a small district in western Szechwan.

To their northwest are the He-shui and the Lu-hua tribespeople; to their southwest, the Chia-jung. To their south are the Wa-ssu people, and to the east and in the valleys, especially in the towns and cities, are the Chinese. By all these the Ch'iang have been influenced, and from them they have borrowed traits and customs.

The language is monosyllabic and tonal, with four tones. Accord-

⁷ Practically all the statements in this section are documented in the writer's book, "The Customs and Religion of the Ch'iang" (1958).

ing to Prof. Wen Yu, it is an early form of the Burma-Tibetan language. In the vocabulary many words resemble words of similar meanings among the Lolos and the Nashis. There are some peculiar sounds, such as the Welsh double l, the glottal g, and a consonant resembling the sound a person makes when gargling and also vocalizing. There is no written language. Their language, customs, history, and physical characteristics indicate that they belong to the Burma-Tibetan branch of the yellow race.

For many centuries the Ch'iang have been governed by the Chinese, although they have occasionally rebelled, especially when the Chinese government was weak. Their final great defeat was under the emperor Ch'ien Lung, who reigned from A. D. 1736 to 1795. They have customs and a religion of their own, having declined to be absorbed by the Lamaism of Tibet or by the culture and religions of the Chinese. They have, however, been much influenced by both cultures.

Since the Ch'iang have no written language, their road to literacy and to advanced culture is through the Chinese language. They have no modern conveniences such as the telephone or telegraph. Travel is generally on foot, more rarely by sedan chair or on horseback. There are no wheeled vehicles, and no boats on the rivers and streams.

The only government is that of the Chinese, and the supreme ruler locally is the Chinese magistrate or *hsien chang*. There are local headmen, mostly Ch'iang but sometimes Chinese, who are appointed by the Chinese government. Disputes are generally settled by the heads of the families concerned, assisted by their friends, and when this fails, the headman may take over. In case he does not succeed in making a settlement, it may be tried in the *hsien yamen*, or the court of the local magistrate.

The Ch'iang have no tribal organization. They are an ethnic group held together by a common language and common beliefs and practices. The family is the social unit and is patrilineal. The father and husband is the ruler of the family and is responsible to the government and to outsiders for their conduct. Property, including land, houses, furniture, and tools and implements, belongs to the family, while clothing and ornaments belong to individuals. For centuries the money used by the Ch'iang has been that of the Chinese.

Some marketing takes place in Ch'iang villages, but most of it is done in Chinese cities and towns, and there is some bartering. Interest is generally very high, varying from 60 to 300 percent a year. Sometimes the interest is paid in maize or in some other commodity.

Ch'iang houses are built of unhewn stone and are generally two stories high. On the first floor is the latrine and pens for the domestic animals. On the second floor is a large guestroom, the kitchen, and one or more bedrooms. The windows on the sides of the houses are few and very small, and there are a few small openings through the roof, which is flat. Across the rear of the roof is a shed in which wheat, barley, corn, and other things may be stored, and on top of this, at the rear and in the middle, is a shrine capped by a sacred white stone. The rooms contain little furniture, and there are no pictures on the walls. As no chimney is provided, the rooms are often filled with smoke. The houses are generally grouped together almost or quite wall-to-wall in villages called *chai-tzu* or fortifications. Each village generally has at least one watchtower, which is sometimes over 100 feet high.

Every Ch'iang is a farmer. He may be in addition a headman, a priest, a carpenter, or a mason, but he depends primarily on farming for a living. Herding the domestic animals, hunting, woodgathering, and carrying loads for Chinese are supplementary occupations.

Maize is the principal product of the soil, other products being wheat, barley, buckwheat, hemp, potatoes, turnips, cabbage, beans, walnuts, apricots, pears, apples, peppers, and other kinds of fruit and vegetables. The domestic animals and fowls are cows, horses, dogs, cats, sheep, goats, pigs, chickens, and ducks. Wild pigs, goats, mountain sheep, bears, takin, leopards, pheasants, and other game are killed and eaten.

Most Ch'iang clothing is made of undyed hemp, so that it is a dull white in color. Some garments are made of Chinese blue cotton cloth, and some of animal skins.

Engagements are made not by the individuals concerned, but by their families through go-betweens. Always it is necessary for the family of the man to make presents to the family of the woman, the value of the presents varying according to the ability of the family of the man to give. There are elaborate wedding ceremonies. When an older brother dies, it is the custom for a younger brother to take the widow as his wife, and any children born are regarded as the children of the older brother.

Formerly all Ch'iang burials were by cremation. In recent decades this custom has persisted in villages more remote from the Chinese, but in many of those near the Chinese it has become the custom to cremate only those who die by unusual or violent means and therefore might become demons, while all other people are buried in graves.

Before the coming of Christianity, all Ch'iang worshiped many gods, but they made no images of them. There are five greater gods, the highest generally being the god of heaven, although sometimes it is the mountain god; 12 lesser gods; and a local god for every locality with a name. In addition to all these, there are rocks and trees that are worshiped as gods. In his sacred chants, every priest calls many gods by name.

It is believed that all diseases and other calamities are caused by demons. When a person becomes ill, he naturally believes that the disease is the work of one or more demons, and he generally calls in a priest who performs ceremonies to exorcise the demons. In some of these ceremonies the priest treads on a red-hot plowshare with his bare foot, and sometimes he touches the red-hot plowshare with his tongue.

These people believe in a superhuman potency that is available through the priest and his ceremonies, and is possessed by the gods, by the priest, and by the sacred implements. This power enables the priests to do what ordinary individuals are unable to do.

All priests marry and have families, homes, and farms. They have sacred chants which are regarded as the equivalent of the sacred books of the Buddhist and Taoist priests and of the Tibetan lamas. Since the Ch'iang have no written language, these chants are memorized and transmitted by one priest to another, from generation to generation. In some regions the line of Ch'iang priests has died out, and there the Ch'iang often employ Chinese Buddhist or Taoist priests.

Every village has a sacred grove, the trees of which are holy and must not be cut down. In or near the sacred grove is a shrine capped by a sacred white stone where animals are sacrificed, and also a very small and plain temple or sacred shelter.

On the top of each house is a shrine for the worship of the 5 great gods and the 12 lesser gods, which is capped by a sacred white stone. Worship at this shrine is generally performed by an older member of the family, but sometimes on important occasions a priest is called to perform the ceremonies.

In springtime there is a ceremony in which the priest prays to the gods for a prosperous year with good crops. He promises or vows in return to sacrifice goats or a *p'ien niu* (half cow and half yak) later in the year. Never is a lamb sacrificed, but always a full-grown sheep or goat or more rarely a *p'ien niu*, and the animal must be without blemish. The sacrificed animal is not burned, but is first

killed and offered to the gods, then cooked and eaten by the worshipers at a feast in the temple. Any left-over food is divided and later eaten in the homes. Worship in the sacred grove, with the sacrifices and the feasts, is a community affair, with at least one representative present from each family. Women are regarded as so inferior to men that they are not permitted even to witness the ceremonies in the sacred groves or on the housetops. Certain religious ceremonies performed inside the homes can be witnessed by the women from a respectful distance.

Cultural contacts of the Ch'iang with the Chinese and with the Chia-jung and other tribespeople have been many and have existed for centuries. Many Ch'iang customs are best explained by cultural diffusion. However, there are many social and religious customs that the Ch'iang regard as their own, which, with their language and their dress, distinguish them as an ethnic group. In more isolated Ch'iang localities the changes have been fewer, and where the contacts with the Chia-jung, the Wa-ssu, or the Chinese have been more abundant, the changes have been many. In some localities the Ch'iang people call themselves Chinese, speak the Chinese language, worship the Chinese gods, and freely intermarry with the Chinese. In others, such as P'u-wa, only a few very old people can speak the Ch'iang language, but the people still regard themselves as Ch'iang. At P'u-ch'i-kou, where the Chia-jung are close neighbors, the influence of Lamaism is evident. Near Li-fan a dance performed by the Ch'iang closely resembles one of the main dances of the Chia-jung. Among the Ch'iang, woven belts are used only near Li-fan and near Wen-ch'uan, where their neighbors the Chia-jung and the Wa-ssu also make and use them.

In former decades the Chinese built Buddhist and Taoist temples among the Ch'iang as a means of cultural assimilation, but this was only partially successful. In more recent years the Chinese have established primary schools among the Ch'iang, and a normal school for Ch'iang and Chinese at Wei-chou. These schools are a very efficient means of absorption. There are those who believe that it is only a matter of time when the Ch'iang will be completely absorbed by the Chinese. Whatever the final results may be, the present is a time of rapid changes, and many old ideas and customs are passing away.

THE TIBETANS AND LAMAISM

Tibet, the western neighbor of China, lies at a higher altitude than any other nation on the globe and is well called "the roof of the

world." The valleys vary from 12,000 to over 17,000 feet above sea level, and its highest mountain peaks from 20,000 to more than 24,000 feet. Some forests occur on the north and on the east, some desert land in the north. Agriculture is carried on in the valleys below 14,000 feet, but most of the territory consists of rolling grasslands between 12,000 and 16,000 feet above sea level.⁸

Tibet is completely surrounded by high mountains. To the north are the Kun Luen mountains, on the east the high mountains of the China-Tibetan border, and on the south and west are the Himalayas. These lofty ranges act as watersheds, so that the rainfall in Tibet averages only about 8 inches a year. The snowfall is light, and most of the moisture falls as rain in the spring, summer, and fall. Temperatures vary from warm in the lower altitudes in the summer to very cold in the winter.

Physically and linguistically the people belong to the Burma-Tibetan branch of the yellow race. In the highlands of the interior and especially among the nomadic herders are found the purest Tibetans, who seem closely related in type to the inhabitants of the northern steppes and deserts. In the valleys to the east, Chinese officials, merchants, and others have generally left their Chinese wives at home in China and taken as wives or concubines local Tibetan women. When later the Chinese have returned to their homes, they have left their Tibetan wives and children in western China or eastern Tibet. This has changed the physical type and the customs of the local Tibetan people. In the valleys in the south and the southwest there have been similar marriages between Indian men and Tibetan women, which likewise have changed the physical type and the customs of the Tibetans. The population of Tibet is believed to be less than 3 million.

The typical Tibetans, especially on the highlands, have black hair, heads slightly round or brachycephalic, thick noses, broad nostrils, thin beards, little hair on the face, arms, and chest, and dark brown eyes. Women and girls often have rosy cheeks and are good looking. The men are strong, and the women are believed to be among the strongest in the world, the Amazons of modern times.

The principal farm products are barley and buckwheat. In addi-

⁸ I have spent three summers west of Tatsienlu or K'ang-ting, which is in Sikang and culturally in eastern Tibet. During several other summers I have had contacts with Lamaism among the Chia-jung, the Hsi-fan, and the Wa-ssu. First-hand observations made on these occasions have been supplemented by the reading of books and articles on Lamaism.

tion some vegetables are raised, such as cabbage, potatoes, turnips, radishes, beans, and peas, and some fruits. Plows are drawn by oxen and yak. In the winter there is much wool spinning, weaving, and knitting.

There are herds of yak, horses, and sheep that graze on the grasslands. The yak yield hair from which tents are made, hides to make boots and other leather objects, and milk from which cheese and butter are made. The butter is eaten with tsamba, drunk in tea, and burned in lamps.

The principal food of the Tibetans is tsamba, tea, butter, and yak meat or mutton. Tsamba is barley ground to a meal and parched. Mixed with butter, it is eaten with the fingers from small wooden bowls. Tea leaves are placed in churns full of boiling water, mixed with butter, salt, and sometimes soda, and churned into powder. In the highlands, for weeks at a time, tsamba mixed with butter, and tea mixed with butter, salt, and soda, are often the only foods eaten. Meat is added when possible, and tea leaves are a substitute for vegetables. Fruit is not available. In the lowlands vegetables and fruit are eaten when they can be obtained.

In the valleys on the east and on the south, where agriculture is possible, there are stone houses two or three stories high, generally with flat roofs, but sometimes with sloping roofs covered with long, thick shingles. Each shingle is held in place by a large stone. In the high altitudes the herdsmen live in tents made of yak hair.

Men and boys spend much of their time riding and hunting, and generally avoid hard work. They often go long distances with the caravans of yak or mules, taking care of the animals or trading. Women do most of the hard work. They carry the water and other heavy loads on their backs, do the weaving and most of the farming. They also do most of the work of herding the flocks and milking the yaks, take care of the homes, and sometimes conduct small businesses and manage other affairs.

Yak are the principal pack animals, but mules and even sheep are also used. There are practically no wheeled vehicles in Tibet, and sedan chairs are very rare. Because of the high altitudes, men almost never carry heavy burdens, and women generally only for short distances. Horses, mules, and yak are ridden, and men and women sometimes walk for long distances.

There are a few great trade routes and many lesser ones, and a great deal of trade. Tibetans export hides, medicines, and wool, and they import from China tea, cotton cloth, porcelains, tobacco, and

other commodities. From India they import mostly manufactured goods.

The Tibetans are fond of play and amusements. This inclination is often satisfied by horseracing, gambling, theatricals, and dancing, and by gossiping, smoking, taking snuff, and drinking tea or wine. Some of these amusements are enjoyed in the homes, but they often center in the lamaseries. Sometimes there are folk dances in the homes, when groups of men and groups of women dance alternately, singing as they dance. The great religious festivals are also social affairs where people meet, talk, and drink tea and wine with their friends. Generally the religious ceremonies are followed by at least one day of horseracing and other games. These festivals are the great social events of the year.

The Tibetans are fond of music. In the evenings at home or when in the saddle, a man often plays a flute. When working in the fields or walking or riding on the roads, a man or a woman frequently bursts into song. Often he or she says in the song what happens to be thought of at the moment. He or she may sing, "It is raining, and if we are not careful we will get wet," or, "The sun is in the sky, and the yak are eating grass." Singing and instrumental music are very important in the religious ceremonies.

Both men and women are fond of ornaments. These include earrings, finger rings, bracelets, necklaces, rosaries, buttons of coral or of silver, snuff bottles, ornamented knives and swords, purses, and tobacco bags. Ornaments are made of, or ornamented with, silver, turquoise, red coral, white bone and shell, and silver coins.

Engagements are made by parents through go-betweens. Sometimes the young man is consulted by his father, but generally the woman is not consulted. A gift must be made to the woman's family—a yak or something else of value. Temporary marriages are not uncommon, and sometimes trials before marriage. A man invites a woman to spend one or more nights with him. If he does not want her, she then goes away. If he wants her, he takes her for his wife or concubine.

Monogamy, polygamy, and polyandry all exist in Tibetan society. Monogamy is the common practice, but polygamy is found among the wealthy, and polyandry among the nomadic herdsmen and in the higher altitudes. Polyandry is considered useful in keeping down the population and in avoiding the division of estates and other property among too many descendants. In polyandry one woman is the wife of all the brothers in the same family and has sexual relations with them. The children are regarded as belonging to the oldest brother.



1. Mr. Sherap, an educated Tibetan Christian, standing in front of the *mani* ("prayer") wheels at the door of a Tibetan Monastery.



2. Tibetan ornamented teapots and bowl.



1. The Gu-lih-ssu lamasery near Yin-kuan-chai, in Sikong province.



2. Tibetan lamas performing a religious ceremony in the Gu-lih-ssu lamasery, Sikong province.



1. A living Buddha, head of the Gu-lih-ssu lamasery in Sikong province.



2. In the center, a living Buddha, head of the Red Lama sect and the third greatest living Tibetan. On either side are the sons of a former local Tibetan king. (Taken about 1925.)



A beautiful Tibetan statue of Maitreya, Chinese Mi-lo-fo, in the West China Union University Museum.

Disposal of the dead is accomplished by several methods: by cremation, by cutting the bodies to pieces and feeding them to the vultures, by leaving the bodies on the mountains for the wild animals to eat, and by cutting up the bodies and throwing them into the streams to be eaten by the fish. Cremation is reserved almost entirely for the lamas, and graves are generally conspicuous by their absence.

Before the seventh century the history of Tibet is legendary, and the culture of the people was very simple and primitive. Tradition says that Avalokitesvara became incarnated in a male monkey and married a she-devil, and that the offspring were the ancestors of the Tibetans.

During the seventh century Srong-tsan Gampo, at the age of 13 years, became king of the Tibetans and began a long and successful reign. He married two wives, one a princess from Nepal and the other a princess from China. Both his wives were ardent Buddhists, and they converted him to Buddhism. A system of writing was adopted, based on the Indian Sanskrit, but adapted to the Tibetan language. Through the influence of his Chinese wife, many Chinese customs found their way into Tibet. Tibetan histories say that at this time rice and barley wines, butter, cheese, pottery, water mills, and looms were first introduced into the country. The king sent children of the chief Tibetan leaders to China to study in the Chinese schools, and many Chinese customs were adopted. The art and customs of India and China mingled with, but did not entirely displace, those of Tibet. Under a later reign tea was introduced from China and earrings from India. Still later books on astrology, astronomy, medicine, and surgery were translated into Tibetan from the Chinese and Indian languages. Apparently the influence of India on Tibet has been greater than that of China.

At first Buddhism met much opposition from the leaders of the native Bon religion and did not make rapid progress. About a century later Padma Sambhava came from India and founded the Red Hat sect or Red Lamaism. He brought with him Tantric Buddhism, which stressed magic and the exorcism of demons. This appealed much to the Tibetans, for the native Bon religion also stressed magic and the exorcism of evil spirits.

During the 10th century there was a revival of Bonism, and Tibet was under a king who persecuted Buddhism. A lama assassinated the king, and Buddhism was soon reintroduced and revived.

Meanwhile numerous Buddhist scriptures and rules of discipline were translated into the Tibetan language. These showed the need of

reform, and this reform was introduced by Tsong-ka-pa, who was born in 1356. He was an eloquent preacher and writer. He enforced celibacy, the use of yellow dress by the monks, fortnightly meetings, confession, and repeating of rules. His sect was called the Ge-lug-pa, which means "the victorious sect." He also introduced elaborate rituals, ceremonial garments, and a hierarchical organization with dioceses dependent upon a central authority.

In 1720 the Talai Lama, who had formerly been only a spiritual ruler, was made the temporal ruler of Tibet by the Chinese. Under him is a regent, called a king, who is also a lama, and there are other civil officials. The Tashi Lama, whose residence is at Tashilhumpo, a monastery near Shigatse, has temporal power over one province and also great spiritual power. The Talai Lama is believed to be the reincarnation of Avalokitesvara, and the Tashi Lama the reincarnation of Amitabha. There are a number of other high lamas who are also regarded as reincarnations of gods, or "living Buddhas," and are worshipped as deities.

During the Manchu dynasty Chinese influence in Tibet was strong and affected the art, architecture, and customs. In art this resulted in the use of floral and dragon designs in paintings.

Most of the art of Tibet is religious, and since Buddhism is the only religion, the art is also Buddhist. In India Buddhism combined Indian architecture and painting with that of the Greeks, brought there by Greek invaders. From India through Nepal this art came into Tibet, where it profoundly influenced the art of the Tibetans. This process went on for centuries. From about the tenth century a slightly different influence was brought by Buddhist monks from the north, especially through Chinese Turkestan. Since the beginning of the Manchu dynasty, a strong Chinese influence has affected the style of the paintings, the roofs, and the temples (Cheng Teh-k'un, 1945e, p. 3).

All Tibetan paintings are anonymous. The painters are monks who are concerned with creating a fine product, but not with claiming authorship or attaining notoriety. No painting is ever autographed. Though there are several schools of art, there is a remarkable uniformity in the paintings of Tibet. They are generally on canvas or on cotton cloth, and seldom on paper. In lamaseries or in private homes the artist is sometimes called upon to paint altars, ritual objects, images, or furniture (*ibid.*, pp. 5-6). Mural paintings are also common, and images are painted as illustrations in books. Tibetan architecture has been influenced by the Chinese, but on the whole the lamaseries have a style of their own.

Lamaism in Tibet is a fusion of Mahayana Buddhism, with a strong mixture of Tantric Buddhism which emphasized the use of magic and the exorcism of demons, with the native Bon religion. While we do not know a great deal about Bonism, it is evident that that religion also emphasized magic and the exorcism of evil spirits.

The number of priests or lamas in proportion to the laity is very large. It is estimated that one out of every five persons is a lama. Every family contributes at least one son to the priesthood, and one lamasery alone is said to have 10,000 priests.

There are three main sects of Lamaism, and several lesser sects. The three main sects are Red Lamaism, Yellow Lamaism, and Black Lamaism. The Red Lama sect is conservative, the priests sometimes marry, and they wear red hats during ceremonies. The Yellow Lama sect is the reformed sect; it enforces celibacy, and the priests wear yellow hats and garments. The Black Lamas are more nearly like the original Bon religion. They are regarded as heretical by the Red and Yellow Lamas. They have their own sacred books, and circumambulate in the opposite direction from the other two sects.

The main characteristics of Lamaism are—

1. *A hierarchical organization of the priesthood, with local dioceses dependent on a central authority.*—Scholars have compared it with the Roman Catholic hierarchy, with the assumption that the resemblances are accidental.

2. *Karma and transmigration.*—This is assumed and believed by the priesthood and taught to the people. One's deeds have their rewards in future existences and determine one's weal or woe, such as whether one is reborn as an insect, a reptile, an animal, a bird, or a human being. The most religious can escape the wheel of transmigration and become Buddhas, enjoying eternal bliss in the Buddhist paradise. Some are reincarnated as Living Buddhas and worshiped on earth as living gods.

3. *Religious festivals.*—Every lamasery is a center for religious festivals, which are often attended by thousands of worshipers, many of whom come from long distances. These are the great religious and social events of the year.

There are variations and resemblances in the religious ceremonies as performed by the Red, the Yellow, and the Black Lamas. Several festivals occur during the first lunar month, and others during the later months of the year. These festivals are accompanied by much music, which is often beautiful and alluring. Among the instruments is a long base horn, sometimes 12 feet or more in length, the sound

of which is subbase and carries for miles. A bugle is shaped like a ram's horn, and a horn is made of a human thigh bone. There are brass gongs and cymbals. A small drum is held in the hand, and a large drum stands erect on a wooden support about 3 feet long. A small brass bell has as a handle a ceremonial thunderbolt. There is an occasional chanting or singing by the lamas, large numbers of whom sing together in powerful, subbase voices.

In some of these festivals past events in Buddhist history are enacted, which entertains the onlookers and at the same time instructs them. During almost all of the time the lamas are dancing, singly, by twos, or in larger numbers. It has been said that the Tibetans dance their religion. The lay people watch, but do not participate, and while they watch, they often prostrate themselves in worship.

A prominent part of these ceremonies is the exorcism of demons, for belief in demons and ways of exorcising them are very important in the lives of the Tibetans.

4. *Belief in and fear of demons.*—Demons are believed to be the cause of diseases, and practically all other calamities are believed to be caused by evil spirits. Priests and lay magicians make use of magic, charms, and incantations to exorcise these evil creatures and protect from them. Sacred instruments are regarded as possessing superhuman power, so that they increase the priests' efficiency. The controlling and exorcising of demons plays a prominent part in religious ceremonies and festivals. This is not restricted to Lamaism, for it is common to all native religions of West China excepting Confucianism and Mohammedanism.

5. *"Prayer" flags and "prayer" wheels.*—Any person who has read much about Tibet is familiar with the objects commonly called "prayer" flags and "prayer" wheels, although neither the Tibetans nor the Chinese call them by these names, nor do they think of their use as praying. The Tibetan name for the cylinder is *mani khorlo*, or jewel wheel. It is so called because the magic phrase, *Om mani padme hum*, oh jewel in the lotus, is written on many of the strips of paper inside. The cylinders vary in size from a few inches to several feet in diameter and in height. The smallest are held in the hand and turned by hand. Larger ones are stationary and are generally turned either by hand or by animal power, although some are turned by wind power or water power.

Besides the magic phrase "*Om mani padme hum*," quotations from the Tibetan sacred books are written on strips of paper and placed inside these cylinders. Whole sacred books are placed in the larger

cylinders, and it is said that the largest contain 20,000 to 30,000 copies of sacred books. The Tibetans believe that every time a person turns a *mani* wheel around once, he has the merit or credit of repeating once everything that is written inside. It is believed that this results in many kinds of blessings and benefits in this life and in lives to come.

The flags, called by the Tibetans and the Chinese *mani* flags, vary from a few inches to more than 50 feet in length. On them are printed the same things that are found in the cylinders. It is believed that every time a flag flaps in the wind, the owner has the credit of repeating once everything that is printed on it.

6. *Om mani padme hum.*—*Om* is a magic word, *mani* means jewel, *padme* means in the lotus, and *hum* is another magic word. It is addressed to, or refers to, the god Padmapani, whose throne is in a lotus flower. The use and supposed results are similar to those of the Chinese phrase, *la-mo-o-mi-t'o-fu*. Some use rosaries as they repeat the phrase, in order to count and to remember the number of times it is repeated.

Sven Hedin, in "Trans-Himalaya," devotes a whole chapter to this phrase (Hedin, 1909, vol. 2, pp. 200-206). It is not so much a prayer as it is a magic phrase with superhuman power to accomplish marvelous things. It is on the lips of the most devout Tibetans from the time they awake until the time they fall asleep. It is written or printed on paper and placed in the *mani* cylinders and is printed on *mani* flags. It is carried in charm boxes and printed on charms. It is carved on the sides of rocky cliffs, or on flat stones which are placed in the temples, by the roadsides or on the sides of small artificial hillocks, or on mountain passes. Many marvelous results are claimed for it. A robber often repeats this phrase while fighting or robbing, and soldiers repeat it when fighting the robbers or when going into battle.

7. *Circumambulation.*—Circumambulation, a religious ceremony practiced by both lamas and laymen, consists of walking around walls, chortens and other sacred objects, or around hillocks on the sides of which are flat stones. On these stones are carved *Om mani padme hum*, or quotations from sacred books. Walking around once gives the worshiper the credit and merit of repeating once all that is carved on the flat stones. The Red Lamas and the Yellow Lamas walk around clockwise, the Black Lamas, counterclockwise.

8. *The gods.*—There are a great many gods, including male and female Buddhist deities from India, many local and many Bon gods, and numerous Tibetan saints. A few are deified animals. Some are

fierce gods treading on the prostrate forms of their dead enemies. Some wear necklaces made of the skulls of their dead enemies. Some have many heads, many hands, and several pairs of legs and feet, and a few have a third eye in their foreheads. What seems most strange and shocking to many Orientals and Occidentals is the sight of great gods embracing their saktis or spouses and actually copulating with them in a standing position.

9. *Superhuman potency*.—Very important is the belief in superhuman potency, a strange, uncanny and superhuman power. Used rightly, it is very beneficial, but, like electricity, when used wrongly it can do a great deal of harm. Numerous lamas and laymen are wizards or shamans, who know the right techniques to make it beneficial to the people. This power is also possessed by all the gods, by magic words and formulas, by sacred implements, and by charms and incantations. Religious ceremonies and festivals employ it and make it useful in satisfying the needs of mankind—food, sex, shelter, honor, long life, a happy rebirth in a future existence, or the attainment of Buddhahood in the Buddhist paradise, and protection from diseases, enemies, and demons.

While the Chinese have influenced Tibetan culture and Lamaism from the seventh century, this influence has increased through social, economic, and political contacts during the Manchu dynasty and the time of the Chinese Republic. This influence has been accelerated during the later years of the Republic by the establishment by the Chinese government of schools among the Tibetans, the Hsi-fan, the Chia-jung, and the Wa-ssus, in Sikang and in western Szechwan, in which schools the Chinese language and Chinese culture have been taught.

Lamaism has also influenced the religions of China, especially Chinese Buddhism, but it would be very difficult to estimate how much. The Chinese have come into contact with Lamaism in Sikang, western Szechwan, Kansu, Kokonor, and Mongolia, and there are Tibetan lamaseries in Peking and in Chengtu. Chinese officials have sometimes paid lamas to conduct religious ceremonies in Chengtu and in other cities of West China. In Chengtu and in other cities of the China-Tibetan border Tibetan priests have occasionally given lectures on Buddhism to the Chinese people.

THE CHINESE

THE JU T'AN, OR ALTAR OF THE SCHOLARS

Whether or not this religion spread from Szechwan into adjoining provinces, and when and by whom it was originated, I have never

been able to learn. Certain it is that it grew steadily during the days of the Republic, until it had temples in most of the cities of Szechwan. In 1928 there was one temple in I-pin, with a population of 100,000, and in 1948 there were three. A nearby city with a population of 10,000 had one temple. In 1948 Chengtu, with a population of over 600,000, had seven Ju T'an temples. None of the other religious sects erected temples, except the Confucian, the Buddhist, the Taoist, and the Mohammedan, although some of them rented, borrowed, or bought places in which to meet and worship and to put up their signs.

The word *ju* means Confucian or the literati. The Confucian religion is often called the Ju Chiao, and thus the Ju T'an borrowed the prestige of the literati or the Confucian scholars. Many officials belonged to this sect, but they also belonged to the Confucianists, the Taoists, or the Buddhists.

The Ju T'an produced and used ceremonially its own sacred books, with the same purposes and the same expected results as among the Buddhists and the Taoists. They had charms and incantations, conducted funerals and memorial ceremonies, and exorcised demons, but they did not have a celibate priesthood. Their greatest distinction was that they obtained messages from the gods or from deceased relatives and ancestors. Often they used the planchette, a table covered with sand, on which two persons skillfully manipulated a pen so as to write characters that they read as messages. Sometimes these revelations were published in books, and some of these books contained the words of Jesus, called the Chi-tu-chiao-chu.

In some of the Ju T'an temples there were dark rooms in which were left pens, ink, and paper ready for writing. No one was supposed to be inside, but later when the door was opened, characters appeared on the paper, supposedly written by the gods. Sometimes a man was left inside who was supposed to do the writing under the guidance of the gods. I heard of one of these men who was supposed to be very illiterate, but when the gods used him to write characters, his writing was beautiful. Most doubting Thomases were convinced during these exhibitions, and I suspect that they were very skillfully and cleverly arranged.

Even more impressive are the works of the mediums in getting messages from deceased husbands, wives, and ancestors for their living friends, relatives, and descendants. These are delivered verbally. In one instance the widow of a wealthy church member at Chi-t'ien-pa, south of I-pin, was the recipient of such a message. She was, of course, able to make a very sizable contribution. In due time

the medium called her by name. "Your husband says," he began, and gave her a long message. She was thrilled, believing that her husband had spoken to her through the medium. I heard of another man who received a message supposedly from his father. On hearing the words of the medium, he knelt down and burst into tears.

What are the reasons for the success and gradual growth of the Ju T'an at the very time when Buddhism and Taoism were waging a life-and-death struggle for their very existence in West China? They are, first, the borrowing of the prestige of the literati through its name; second, the uses of methods and ceremonies acceptable to most of the people; and third, and I would say mainly, because of its supposed ability to obtain at will messages from the gods and from deceased relatives and ancestors.

THE WU CHIAO, OR RELIGION OF MAGIC

In any village, town, or city in Szechwan one can find *tuan kungs*, sometimes called *yin-yang hsien sheng*, or professors of *yin-yang*. The front doors of their homes are generally wide open, as though to invite passersby to enter. On the two sides of the front room one will see a great many herbs, bones, etc., which are used as medicine. In the center, on a table below the shrine, are printed or written paper charms and instruments of divination. Against the back wall, on the floor, on the table, or on the shrine, are 30 to 50 images of various deities. Among these are the god of wealth, Kwanyin, the goddess of mercy, and many other of the more common gods. One of these is Wu Ts'ang, who is an acrobat, standing on his hands on the back of a tiger, his heels in the air. When business is dull and the magician has not enough to do, he sometimes sends out Wu Ts'ang, who harms people, causing them to come to the *tuan kung* and pay him for recalling the god or exorcising demons. Two others of the gods, a male and a female, have heads but no bodies. When called to people's homes to conduct ceremonies, the *tuan kung* takes these two gods, has the hosts furnish the clothing, and performs his ceremonies.

At funerals and memorial ceremonies, people who are very poor often employ a *tuan kung*, while others with more money call in Buddhist or Taoist priests. The priest of the Wu Chiao sect is regarded as belonging to a *hsi chiao*, or heretical society of black magic. Unlike Buddhist or Taoist priests, he leaps and dances as he performs his ceremonies, much like the Ch'uan Miao *tuan kung*. Indeed, there are those who believe that the Chinese *tuan kung* learned his art from the Miao, and among the Miao he is orthodox, while among the Chinese he is heretical.

The *tuan kung* prints and sells paper charms of many kinds for many purposes, exorcises demons so as to heal all manner of diseases and to protect individuals and families from various kinds of calamities, conducts funerals and opens the way of the departed soul to Hades, conducts memorial ceremonies, chooses lucky days, divines, performs magical ceremonies to give good crops, brings happiness and prosperity, and chooses lucky places for graves, houses, and stores.

Some priests among the Ch'iang assert that they are of the black religion, presumably having learned their arts from Chinese priests of this order.

This religion is found in many provinces of China, and the priest is so common among the Chinese that it is conceivable and even likely that the Wu Chiao and its practices came down from ancient times in Chinese religious folkways. A significant fact is that in the cities of Szechwan, when temples of other sects were very rapidly disappearing, the *tuan kung* could still be found carrying on, although he doubtless suffered losses in customers and income.

THE T'UNG SHAN SHE, OR SOCIETY FOR COOPERATION IN GOODNESS

This society was organized in Peking by Yao Chi-ts'ang, a man of Szechwan Province. It was really an offshoot of the Tao-teh-hsüeh-she, whose aim is to unite all religions into one. It became very successful and widespread but finally died out or was driven underground by government prohibitions.

This society also proclaimed that its main purpose was to unite Confucianism, Buddhism, and Taoism with the other great religions, including Christianity. It was believed, however, that its real aim was to restore the Manchu dynasty. It is conceivable that this struck a sympathetic chord in the hearts of many Chinese people, for during the early days of the Republic, society in China was very much disturbed, prices rose higher and higher, and the people became poorer and poorer.

The headquarters of this society was in Peking, and it had at least 400 branches throughout China. It was a secret society with 16 degrees, a person becoming a teacher after receiving 4 degrees. All instruction was given verbally in an inner shrine, and candidates were advanced one degree at a time. All were under a solemn oath not to reveal the secrets.

The members were all men of the gentry and official classes. The fact that it was strictly secret and had for a main object the restoration of the Manchu dynasty is sufficient to explain why it was pro-

hibited by the government and finally disappeared before World War II.

THE INTERNATIONAL UNION OF THE RELIGIONS OF SIX SAGES, OR
THE MOTHER RELIGION

After the establishment of the Chinese Republic in 1911 Szechwan Province was the scene of many battles and wars. It is possible that more turmoil and more disturbances from wars and from the ravages of brigands existed in Szechwan than in any other part of China. In addition, through schools and schoolbooks, trade, moving pictures, newspapers, magazines, and many other agencies, there was a tremendous impact on the people of West China of new ideas, customs, and ideals, and these brought great changes in the lives of the people. These in turn produced great changes in religious beliefs and practices, and several new religions or religious sects were founded.

The founder of this new religion, T'ang Huan-chang, was a holder of a Manchu dynasty bachelor of arts degree who considered himself to be a prophet. After receiving his bachelor of arts degree, he came to Chengtu in search of employment. Here he attended a Christian church, received Christian instruction, and was baptized. He was constantly arguing with his pastor that Christians should study Confucianism, Mohammedanism, Buddhism, and Taoism, and because of this and irregularities in his conduct, including the smoking of opium, he was dismissed from the church.

T'ang Huan-chang asserted that a few years after the establishment of the Chinese Republic he received the seventh and greatest seal, which meant that he was the final and greatest prophet, to whom the others were preparatory. He wrote at least 30 books, including commentaries on the other great religions.

In addition to writing, he also sought disciples and messengers, and was unusually successful. Apparently many gave him money. One Chinese official, near the beginning of his career, sought out T'ang Huan-chang at his home, prostrated himself before him, and called him his teacher. Many others followed this example, and his disciples and messengers were sent all over China.

There were 13 degrees to membership, in the first of which one swore himself to secrecy. Each person was to try to fast 40 days, and many tested their faith by eating centipedes. T'ang planned to send his literature all over the world, but Chinese officials prevented his doing so.

The 16 commandments, 8 positive and 8 negative, were as follows:

A. Those to be observed:

1. To strongly believe in God.
2. To diligently cultivate personal virtue.
3. To obey parents, respect elder brothers, love younger brothers, and to be faithful to friends.
4. To speak and act honestly.
5. To sincerely exhort people to be moral.
6. To give to the poor as much as one can afford.
7. To abide by the laws of the country where one lives.
8. To have a proper vocation.

B. Those to be prohibited:

1. To believe in heterodoxy, magic, or idols.
2. To kill persons.
3. To commit adultery.
4. To steal.
5. To rebel.
6. To drink wine, fight or contest with others, or indulge in bad habits.
7. To gamble.
8. To interfere with politics.⁹

To become a member of this new sect, one must take 13 steps, the first of which was to swear to keep the teachings secret except to other believers, who also swore an oath to keep them secret. The second of the 13 was to attempt to fast 40 days as Jesus did. The fasting was to be in a secluded spot, accompanied by meditation.

T'ang issued at least three manifestos, in which he foretold a worldwide catastrophe to take place on September 25, 1923. One was published in the *West China Missionary News*, January 1924. It was entitled "A Thunder Clap," and foretold on that day the greatest earthquake that ever occurred, the greatest flood that ever occurred in the world, the greatest shock in the air that ever occurred, that many stars would fall on the earth, and that many angels and numerous heavenly soldiers would come into the world. He issued warnings to kings and presidents of all nations, to ministers and officials, to soldiers of all nations, to scientists and philosophers, to capitalists, to laborers, to Christians, Mohammedans, Jews, Buddhists, Confucianists, and Taoists. The following is a shorter manifesto that the writer collected and preserved.

PREPARATION FOR THE GREAT TRIBULATION

1. The general preparation is to avoid hunger, thirst, and coldness. Besides this, nothing could be prepared by human beings, for it is in the power of God.

⁹ *West China Missionary News*, January 1924, p. 4.

2. Those who live near rivers, lakes, or seas ought to move before the 24th of September of this year to the high hills, but not to the sides of cliffs.

3. If there are no hills nearby, then the people should move onto ships, the ropes of which must be fastened very strongly.

4. Those who live near cliffs should move to the plains.

5. Those who live in high brick buildings should move into smaller and lower houses.

6. It will be best to live in thatched huts, if available.

7. Old people and younger children should put on warmer clothes before the 15th of the 8th moon of the older calendar.

8. Those who usually fear cold weather should prepare some good wine and put it in a bamboo or tin tube for the purpose of keeping away cold.

9. Pregnant women should prepare a good deal of milk, mixed with boiling water, and then keep same in a bamboo or tin tube for use during the tribulation. Also, some good wine should be put into the milk in order to avoid injurious effects.

10. Milk should be purchased for children, and the milk should be mixed with boiling water before the 16th of the 9th moon of the old calendar. When they are hungry, the milk may be given to them. If the milk is too cold for children, their urine may be poured in to make it warmer.

11. In the places where no milk is available, lotus-root flour should be obtained and mixed with boiling water before the 15th of the 8th moon. If no lotus-root flour is available, well-cooked congee may be used instead. If people fear the coldness causing trouble to their stomachs, some cardamon flour may be poured in, or ginger water may be used to mix the lotus-root flour.

12. The food which should be prepared varies at various places. At any rate, locally available food should be secured and made into a quality neither dry nor wet. Food which can be eaten when cold is best for preparation.

13. The prepared food should be sufficient for five or six days' use, and must be brought with the persons.

14. If no water is available when one is thirsty, one may drink one's own urine. One should also prepare some capsicum to quench one's thirst. Only one or two seeds of capsicum should be used at a time.

15. After the great tribulation (or calamity) neither dry nor food difficult-to-digest should be eaten, but only vegetables and porridge may be taken. Within three or four days after the great tribulation, one should not eat too much.

16. When the great tribulation comes on, each person should remain in his own place, and should not move away during these days. Those who are outside should not enter the houses; those who are inside should not go out of the houses. Although one may have relatives at other places, one should not go to see them. When any sound is heard, no one should look out, lest the fatal punishment of the angels and the heavenly soldiers fall on them.

July 13, 1923.

*Published by the International Union of Six Sages,
Chengtu, Szechwan, China.*

A BRIEF SUMMARY OF THE COMING GREAT TRIBULATION

The genuine doctrine of God has come down in Chengtu, Szechwan, China. As God witnesses for his doctrine, he will show great wonders. People of all

nations and of all tribes should get ready. The wonders will be of six kinds;

1. There will be severe earthquakes.
2. The sun and the moon will be darkened for five days.
3. Great stars will fall on the earth.
4. There will be unusually great thunders, tempests, and hailstones.
5. The oceans and seas will overflow their banks, and sinners will be drowned.
6. Many angels and heavenly soldiers will descend to attack evil persons.

N. B. Any enquiries about this doctrine may be sent to the International Union of Religions of Six Sages, Tao Kwang Sou, Chengtu, Szechwan, China.

REPRINTS ARE WELCOMED

The day of the prophesied worldwide catastrophe arrived, but nothing unusual occurred. Food prepared in too large quantities molded and rotted, and had to be thrown away. Protests to the government of Chengtu and of Szechwan began to pour in from all over China, from people who had been disturbed or excited or had been inveigled out of their money. T'ang Huan-chang was arrested and executed.

One would naturally suppose that the death of its founder would bring to an end the International Union of the Religions of Six Sages. However, the descendants and followers of T'ang explained his death by saying that he went to heaven, just as Jesus did, and they continued to send messengers, publish and scatter literature, and to solicit followers. They further developed his doctrines, and changed the name of the religious sect to Mu-chiao, or the Mother Religion, saying that Jesus is God's son, and God must be a mother since only a mother can bear a son. The number of followers of this sect in 1948 was very few.

THE POPULAR OR FOLK RELIGION OF SOUTHWEST CHINA

Some oriental scholars, realizing that the dominant religion of China is found in the beliefs and practices of the common people, have called that religion "animism." Instead of defining it in that way, I shall simply describe what I believe to be the most important traits and customs that I have observed. Some of the beliefs and assumptions underlying these customs are comparatively primitive, and for that reason it may seem strange that they should persist among a people as cultured as the Chinese.

One explanation is that modern science, with its naturalistic explanations of phenomena, had not penetrated Chinese society. Another is that 95 percent of the people were illiterate. This included

virtually all the women, since formal education for girls had barely made a beginning in China by the end of the 19th century. Women are generally more religiously inclined than men, and they had much to do with the education of the children. Though it is true that the ideas of the scholars influenced the ordinary Chinese people, it is also true that the beliefs and practices of the common people strongly influenced the scholars and rulers of China.

In my study of religion in West China, my main interest has been the folk religion of the Chinese. My aim has always been to be objective, to find out what the people themselves believed and thought. Not only have I witnessed many ceremonies and festivals, but I have talked about their beliefs with many hundreds of Chinese of all classes, checking and rechecking my conclusions. What I found to be true in southwest China may or may not be true in some other parts of China.

YIN-YANG AND FENGSHUI, MYSTERIOUS POTENCY

In the China that was, everything is either *yin* or *yang*. Women are *yin*, and men are *yang*. The moon is *yin*, and the sun is *yang*. Some stars are *yin*, and others are *yang*. The under side of a table or chair is *yin*, and the upper side is *yang*. The shady side of a mountain or hill is *yin*, and the sunny side is *yang*. Some diseases are *yin*, and others are *yang*, and some medicines are *yin*, and others are *yang*. Even the weather is affected by the interaction of the *yin* and the *yang* elements. When the weather is cloudy, the *yin* predominates, and it is likely to rain. A cloudy day is called a *yin t'ien*, and a bright, sunshiny day is called a *yang t'ien*. When the *yang* predominates, the weather is fair. The four seasons are regarded as a struggle between these two elements. Half the year the *yin* predominates and the weather is colder. The other half of the year the *yang* predominates and the weather is warmer.

The Chinese divided all substances into five elements: metal 金, wood 木, water 水, fire 火, and earth 土. Each of these was subdivided into the *yin* and the *yang*, as shown below. The significance of this diagram is that each of the five elements can be either *yin* or *yang*.

<i>yin</i> 陰	The five elements	五行 <i>yang</i> .	陽
辛	Metal	金	庚
乙	Wood	木	甲
癸	Water	水	壬
丁	Fire	火	丙
己	Earth	土	戊

The most important theory in Chinese medicine is that of the *yin* and the *yang*, which are believed to pervade the entire body. When they are properly balanced, the person is well, but when there is a predominance of either one, the person is ill. If the *yin* predominates, he has a *yin* sickness, and is likely to have chills. Predominance of the *yang* produces a *yang* illness, usually with a fever. All medicines are either *yin* or *yang*. For a *yin* sickness, a person must take *yang* medicine until the *yin* and the *yang* are equally balanced, and then he will be well. For a *yang* sickness, he must take *yin* medicine until the balance between the *yin* and the *yang* in his body is restored. The interaction between the *yin* and the *yang* in the body produces the pulse (Morse, 1928, p. 96). Food is also divided into the *yin* and the *yang*, and if not correlated with the medicines and the diseases, treatment of the diseases will be hindered (*ibid.*, p. 103).

The successful diagnosis and treatment of diseases depend on and are based on not only the doctrine of the *yin* and the *yang*, but also on their interaction with the five elements, the five planets, the five colors, and the five tastes (*ibid.*, p. 95).

A matter of much importance is the fact that in West China many social relationships and customs were permeated with and determined by the *yin-yang* concept. *Yin* is dull, female, inferior, while *yang* is bright, male, superior. Women must sit on the right side of their husbands, for that side is inferior, and men must sit on the left, for that side is higher, and men are superior. Women should obey their fathers, their fathers-in-law, and their husbands, for the welfare of society depends on keeping women in subjection to the men. Women were not educated, for that would make them harder for the men to control. Sons were more valued than daughters, and the social position of a woman was higher and more secure after she had given birth to a son.¹⁰

The following quotation from the *Encyclopaedia Sinica* (Couling, 1917, pp. 615-616) is illuminating:

YIN and YANG, the negative and positive principles of universal life. These words meant originally the dark and bright sides of a sunlit bank and occur on the Stone Drums (6th century B. C.). By the time of Confucius they had

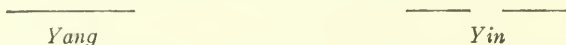
¹⁰ I have discussed this theory many times with Chinese friends in West China. All agreed that the above statement of the theory is approximately correct. Most educated women and some men, however, asserted that the principle is wrong, and that there should be equality between the sexes. In my classes in the Union Theological School, I sometimes brought this question up for discussion, and a lively debate would ensue. A few of the men affirmed that the old theory is good, and the women argued for equality between the sexes.

acquired a philosophical significance as the two aspects of the duality which the Chinese thinkers perceived in all things. Traces of the dual notion occurred in the "Great Plan" of the Shu Ching, but the actual words *Yin* and *Yang* as used in this sense occur first in the pseudo-Confucian commentaries of the I-Ching.

In this way *Yang* comes to mean Heaven, Light, Vigour, Male, Penetration, the Nomad. It is symbolized by the Dragon and is associated with azure color and oddness in numbers. The *Feng Shui* raised-land forms (mountains) are *Yang*.

Similarly *Yin* stands for Earth (the antithesis of Heaven), Darkness, Quiescence, Female, Absorption, the Duad. It is symbolized by the Tiger and associated with orange color and even numbers. Valleys and streams possess the *Yin* quality.

The two are represented by a whole and a broken line respectively, thus;—



Groups of three such lines are known as "trigrams," groups of six as "hexagrams," and the I-Ching is classified under the sixty-four possible hexagrams.

In common with the five elements, the *Yin* and the *Yang* have been for at least two thousand years used to interpret the processes of nature, and they are the fundamental features in the theories which underlie *Feng Shui*, Astrology, Divination, and Medicine.

T'ai (Great) *Yang* means the Sun, *T'ai Yin* the Moon, *Shao* (lesser) *Yang* the fixed stars, and *Shao Yin* the planets, these four being supposed to be the four primary combinations (Hsiang) of *Yin* and *Yang*.

Yin and *Yang* are themselves supposed to have proceeded from a "Great Ultimate."

Closely related to the *yin-yang* concept is that of *fengshui*. The fact that the *tuan kung*, the magician or geomancer who is the priest of the Wu Chiao, or Witch Society, or the Society of Black Magic, is also often called the *yin-yang hsien-sheng*, or the professor of *yin-yang*, and also *fengshui hsien-sheng*, or professor of *fengshui*, suggests a very close relation between the two.

Fengshui is regarded as exceedingly important. No family would build a house or a store without first engaging a *fengshui* professor and making sure that the *fengshui* of the place is good. It is believed that if the *fengshui* of a store is good, the business will prosper. If the *fengshui* of the house in which the family lives is good, the family will prosper, having numerous descendants, becoming wealthy, and producing scholars and officials.

Of very great importance is the location of the ancestral graves. If the *fengshui* of the graves is good, and the coffin and the corpse are pointed in the right direction, the descendants will prosper, increasing in numbers and wealth and becoming scholars and officials. If the *fengshui* of the ancestral graves is bad, calamities will ensue

among the descendants, and they will not prosper. People have been known to do things that they believed would ruin the *fengshui* of the ancestral graves of their enemies so that their enemies would not prosper.

The *fengshui* of towns, cities, prefectures, and larger areas is also regarded as important. It can be improved by temples, pagodas, *fengshui* stones, and *fengshui* trees, and can be affected for good or ill by the location of city gates and by other factors. If a *fengshui* professor finds that the *fengshui* of a city gate is bad, the gate may be closed permanently. If he finds that the *fengshui* of a city or region is bad, measures will be taken to improve the *fengshui*. A few miles down the river from Lo-shan, a tower with several stories was built to improve the *fengshui* of the city. The natural features of a locality, the nearness, directions, and shapes of the mountains, hills, and ridges, and the nearness and directions of streams, valleys, and depressions, determine whether or not the *fengshui* of a particular spot or locality is good.

One way to improve the *fengshui* of a city or a locality is to erect a pagoda. Practically every town or city has at least one pagoda, and I-pin has three—the white pagoda, the black pagoda, and the old pagoda. But a pagoda must be in the right place, or it can do harm.

At Pai-shou-ch'i, a city west of I-pin, there was formerly a pagoda on the south side of the Yangtse River. Because some scholars living in the city died, it was decided that the pagoda was not in a good spot and was harming the *fengshui* of the city, so it was torn down and the city has no pagoda. About 25 miles up the Min River from Lo-shan is the village of Hsiang-pi-ssu, or Elephant's Nose Monastery. Years ago the people began to erect a pagoda to improve the *fengshui*, and soon after the work was begun, some local scholars died. It was decided that the pagoda was wrongly located, so that it was ruining the *fengshui* of the town, and the pagoda was never completed.

Some temples are believed to have a good influence on *fengshui*. A short distance east of An-pien is a large temple from which one can look up the narrow valley of the Huen-chiang River, which enters the Yangtse River here from the south. People believe that this temple exerts a very important influence for good on the *fengshui* in and around An-pien by opposing and turning back any harmful influences that may come down the valley of the Huen-chiang River.

There are a great many *fengshui* trees and *fengshui* stones in West China. The *fengshui* tree may be a banyon, a cypress, a pine,

or some other kind of a tree, but it is always a large, old tree. The *fengshui* stones are very often stones that are prominent in the landscape and strange and striking in appearance. Such trees and stones are alike in that they affect for good the *fengshui* of the family, city, or region concerned, and in that they simply must not be cut or injured, for that would spoil the *fengshui* and bring calamities instead of good fortune to those concerned.

In the rear of the Ta-o-ssu monastery on Mount Omei, inside the temple and growing up through the roof is a great pine tree that is worshiped as a god and is also the *fengshui* tree of Omei-hsien. Near the Hsin-k'ai-ssu monastery on Mount Omei is another great pine tree that is the *fengshui* tree of Ch'ien-wei, which city is 120 *li* down the Min River from Lo-shan. Near Hsüin-chien-ssu, very close to the cliff in which is the sacred cave called the Chin-sha-tung, or Golden Sands Cave, is the *fengshui* tree of a powerful family that lives not far away. At Kan-pai-shou on the Min River above I-pin is an old dead cypress tree that is the *fengshui* of that town. These instances could be multiplied indefinitely.

Formerly the streets of I-pin were very narrow, and in them were several large *fengshui* stones that made it more difficult for people to pass up and down, especially when carrying loads or sedan chairs. No one dared to chip them down so that they would not obstruct traffic—that would certainly cause calamities among the people of the city. In 1929 I-pin had a progressive mayor who widened and paved the streets, and had stone masons chip away the stones. Nothing harmful happened to the people of I-pin, and this lessened their fear of, and respect for, *fengshui* stones.

Between An-pien and Lou-tung, west of I-pin on the north shore of the Yangtse River, is a strange-looking rock that for decades has been the *fengshui* stone of the important Lin family of Lou-tung. At Chiang-chioh-ch'i, about 20 miles up the Min River from I-pin, a large, round, pointed rock that resembles the upright piece of wood to which boatmen attach their oars is the *fengshui* stone of the nearby village of Chiang-chioh-ch'i. A short distance below P'in-shan, which is west of I-pin on the Yangtse River, is a strange-looking rock that is the *fengshui* stone of P'in-shan.

Across the Yangtse River from An-pien, in the mouth of the Huen-chiang River, is a large rock on which many boats have been wrecked every year, with much loss of life and property. It could easily be broken to pieces and removed at the time of low water, but the people are afraid to do so. It is the *fengshui* stone of An-pien,

and if it should be injured or destroyed, much harm would ensue to the people of An-pien.

About halfway between I-pin and Li-chuang, on the south side of the Yangtse River, is a large rock that is the *fengshui* stone of the Lo family who live on the north side of the river and who formerly were very rich and powerful. It is said that when someone chopped wood at the home of the Lo family, the rock would move. This stone was on the property of the Chang family, who were jealous of the prosperity of the Lo family, so they hired stone masons to cut up the *fengshui* stone. The Lo family went to law about it, and the lawyers were so clever that they prolonged the expensive lawsuit several years without reaching a decision. The two families therefore agreed to settle the matter out of court by throwing silver into the river. The family that threw in the most silver would win. The Chang family threw in pewter, but the Lo family threw in a great deal of silver. After that both families were poor, and the people attributed the poverty of the Lo family largely to the fact that its *fengshui* stone had been injured.

What is *fengshui*? The following quotation from the Encyclopaedia Sinica will throw some light on the question.

FENG SHUI, 風水, wind and water. (The outward and visible signs of celestial *Yang* and *Yin*.) The art of adapting the residence of the living and the dead so as to co-operate and harmonize with the local currents of the cosmic breath (*Yin* and *Yang*, q. v.); often incorrectly called "geomancy."

It is believed that at every place there are special topographical features (natural or artificial) which indicate or modify the universal spiritual breath (*Ch'i*). The *forms* of hills and the *directions* of watercourses, being the outcome of the moulding influences of wind and water, are the most important, but in addition the *heights* and *forms* of buildings and the *directions* of roads and bridges are potent factors. From instant to instant the force and direction of the spiritual currents are modified by the motions of the sun and moon, (see astrology), so that at any particular time the directions of the celestial bodies from the point considered are also of great importance.

The professor of Feng Shui employs a *lo-pan* (graduated astrolabe with compass) to observe directions and astrological harmonies, while at the same time he notices the *forms* which the spiritual forces of nature have produced.

By *talismans* (dragons and other symbolic figures on roofs and walls, pagodas on hills, or bridges) and *charms* (pictures of spirits or "words of power" inscribed on paper scrolls or stone tablets), the unpropitious character of any particular topography may be amended.

Artificial alteration of natural forms has good or bad effect, according to the new forms produced. Tortuous paths are preferred by beneficent influences, so that straight works such as railways and tunnels favour the circulation of maleficent breath.

The dead are in particular affected by and able to use the cosmic currents for the benefit of the living, so that it is to the interest of each family to secure

and preserve the most auspicious environment for the grave, the ancestral temple, and the home.

There is copious native literature on the subject with elaborate rules, plans and theoretical information (Couling, 1917, p. 175).

To sum up, *fengshui* is the outworking of the *yin* and the *yang* in nature. It is a mysterious power or potency that affects for good or ill the welfare of families, cities, and larger regions. It is often localized in strange and awe-inspiring trees and stones. It is affected by the natural features of the landscape, such as mountains, hills, streams and valleys and their directions, and by the sun, the moon, and the stars, and also by artificial features such as pagodas, temples, houses, towers, railways, roads, and tunnels. It is understood by the professor of *yin-yang* and *fengshui*, who uses a *lo-p'an* as an instrument to make his calculations. There are a number of books that explain its operations, and I have been told that it requires about three years of study to become a professor of *yin-yang* and *fengshui*.

There are many customs in West China that can be explained by the assumption that there is a strange, mysterious, superhuman power which can be injurious, but which also can be used for the benefit of men. A few illustrations will be given.

There is a bird in West China that migrates at night, flying in flocks north in the spring and south in the fall. The members of the flock call to each other as they fly, and their voices vary in pitch. There is a very strong belief in Szechwan that this is a nine-headed bird, with two legs and two wings. One man tells you that his father saw one, and another that his grandmother saw one. When they fly over a house, the people beat on the doors and shout to frighten the bird away. They believe that if a drop of blood or a feather or some of the offal of this bird should fall on the family property, members of the family would become ill and possibly die.

In the medicine shops, bones of leopards, tigers, and other fierce creatures are sold as medicine. It is assumed that because these animals are very powerful, their bones possess an unusual power to heal diseases.

A short distance from I-pin is a large white mass of sandstone that is worshiped as a god. A temple has been built around it, and other idols have been added. For a small sum of money the priest will permit you to rub off a few grains of sand and take it away. It is assumed that the grains of sand possess a peculiar power, so that if they are put in water and the water drunk, the mystic power will heal diseases.

On Mount Omei there are bronze pagodas that are supposed to have been erected during the Ming dynasty. Pilgrims rub brass or copper coins on them and carry the coins away to use as charms, believing that power to protect people from diseases, demons, and calamities has been transferred to the coins by rubbing them on the sacred objects. In the Wan-nien-ssu on Mount Omei is a bronze statue of P'uhsien riding a bronze elephant. So many of the pilgrims rubbed coins on the statue or on the bronze elephant, in order to turn the coins into charms, that a protecting fence was built around the statue to keep it from being ruined. In the Green Goat temple at Chengtu are two brass goats. A person who has a sickness or a pain first rubs a spot on one of these goats corresponding to the location of his pain, then rubs himself in that spot, believing that this will heal him. It is assumed that there is a transfer of power by rubbing.

The number of charms is almost endless. The almanac, mirrors of glass or of metal, pieces of jade or of amber, charms of copper, brass, or bronze that look like large coins, and literally hundreds of kinds of paper charms are used. The print of the seal of an official or a similar print of the official seal of a *tuan kung* or of a Buddhist or a Taoist priest is valued and used as a charm. Written or printed paper charms are hung above the front doors of houses, on beds, or on other places in houses, stores, or temples in the belief that they have superhuman power to protect from demons or calamities. All charms are believed to have this superhuman power.

Certain stones and trees are worshiped as gods, and other gods are made of clay, wood, stone, and many kinds of metal. They vary in height from a few inches to that of the great Buddha at Lo-shan, which is over 200 feet high. They all have one thing in common—they are believed to possess marvelous superhuman power to help or to harm people. Sometimes an idol is believed to have lost this power, and then he is neglected, and he and his shrine or temple are allowed to go to ruin.

There is one important sentence, known by practically all Chinese in West China, which is used to sum up the philosophy underlying the practices of medicine and healing, divination, *fengshui*, geomancy, astrology, magical ceremonies, and all practices and beliefs related to the use of a superhuman potency. It is, "The Chaos gave birth to (or produced) the Great Extreme, the Great Extreme gave birth to the Two Powers, the Two Powers gave birth to the Four Primary Combinations (or Symbols), the Four Primary Combinations pro-

duced the Eight Trigrams, and the Eight Trigrams determine the lucky and the unlucky." The Chinese in West China affirmed without hesitation that this is the key to their more primitive philosophy and practices, and that the two *i* 儀 or powers are the *yin* and the *yang*.

Prof. Clifford H. Plopper, in "Chinese Religion Seen through the Proverbs," gives this same proverb exactly in the form given above except in the last phrase, which he translates as follows: "Out of Nothingness was born the Great Extreme; this produced the Yin and Yang; these then produced the four Symbols; they the eight diagrams; and they the sixty-four hexagrams." (Plopper, 1926, p. 20.) While the word *i* means powers, the powers meant here are the *yin* and the *yang*, so that Dr. Plopper's rendering is correct, although it is not a literal translation. Williams, in his dictionary, "A Syllabic Dictionary of the Chinese Language," gives "a power as in nature" as one of the meanings of *i*, and many Chinese in West China have assured the writer that this is the meaning here. (Williams, S. Wells, 1909, p. 393.)

In 1929, after nine years of searching for a name in the Chinese language for this mysterious potency that pervades all things and is the power found in *fengshui* and other magical practices, I made the following statements:

One who searches in the religion of the common people of China for a single term denoting that mysterious potency, now designated by the word "*mana*" in scientific circles, will be disappointed. There is no such single term. (Graham, 1929a, p. 235.)

The writer is convinced, and advances as a tentative theory, that the conception of a mysterious potency, often more or less vague and undefined, but none-the-less real, is a primary key to the interpretation of the popular religion of the Chinese people which has come down through the past millenniums, and that its philosophical interpretation has been worked out in the conception and doctrine of *yin-yang* and *fengshui*. (Ibid., p. 237.)

In his book, "Chinese Peasant Cults," published in 1940, Prof. Clarence Burton Day quotes these two statements. He also quotes J. C. Archer as suggesting the word *ch'i* 氣 or breath as a possible word for the *mana* concept and adds,

We wish to put forward here the equally tentative theory that we shall find in the word *Ling* 靈 meaning "spirit force," "effective" or "efficacious," the term for *mana* in Chinese religion for which we have been looking. As evidence of this, we can here mention but five places where it occurs in the sense of this underlying and rather immanent potency. (Pp. 171-172.)

The first two instances given by Professor Day refer to the two thunder and lightning charms mentioned by Dore in "Chinese Super-

stitutions," about which the word *ling* is used as an adjective meaning efficacious. He quotes Dore as saying in a footnote, "thunder, according to the Chinese, is produced by the *Yin* and the *Yang* coming into collision." (Pp. 172-173.)

The next illustration given by Professor Day is the use of *ling-chu*, "sepulchre of the soul." Dore and Day interpret this term as meaning soul and, at the same time, efficacious. The use here is almost exactly like that of *ling-p'ai*, or spirit tablet. It is very likely that the Chinese here think of *ling* as meaning primarily the soul of the dead person, and only secondarily if at all as meaning efficacious. Professor Day gives two more instances in which *ling* is an adjective meaning efficacious. (Pp. 172-173.)

More instances could be given. *Ling-nien* means efficacious, or possessing this mysterious potency. *Ling-tzu-ch'ao* is the name of a marvelous grass that, if eaten, enables a person to live forever without aging. However, *ling* is often used to designate a human soul, especially that of a dead person, and the phrase in the Christian New Testament, "God is a spirit," is translated "*Shang-ti shih i ko ling*." It seems that the word *ling*, or some combination of it with another Chinese word, ought to designate the *mana* concept, but this is far from being proved.

Between the years 1920 and 1948 I often talked with Chinese in West China about the *yin-yang* and *fengshui* concepts, and also the *mana* concept. I discussed it in university classes and in classes in the Union Theological School, and discussed with many Chinese the possible use of *ling*, *shen* 神, and *ch'i* 氣, as names of the *mana* concept. The persons consulted included scholars, university and theological school students, merchants, priests, and many common people. Not one of them felt that either of these words was an appropriate name for this mysterious potency. They all agreed that the *yin-yang* and *fengshui* concepts are the Chinese equivalent of the *mana* concept. This leaves me in the same position that I took in 1929 and quoted above. It is very likely that Chinese anthropologists will give us the correct term, either by using old Chinese words or by transliterating the word *mana*.

ANCESTOR WORSHIP

As we have already stated, at the very beginning of Chinese history ancestor worship was already an old and well-established custom (Addison, 1925, p. 3; Creel, 1935b, pp. 80, 126, 174). It has long

been and still is the most important Chinese social and religious custom.

A basic idea in filial piety and ancestral veneration is that there is a mutual dependence between the living and their dead ancestors. After death the deceased need the same things as before—food, shelter, clothing, money, tools, weapons, etc., and it is the duty of the living descendants to provide them. In addition, the younger generations must treat their parents and all ancestors and elders with respect, reverence, and love (Creel, 1935b, p. 175).

The deceased ancestors are actively interested in the welfare of their descendants. If they have been provided with the things to supply their needs, they help and protect their living descendants, giving them long life, wealth, happiness, and success. On the other hand, if the ancestors are neglected, are not shown honor and respect, and are not provided with the things they need, they become angry and resentful and inflict punishment upon their living descendants. They become demons.

A very important question is, Do the Chinese worship their deceased ancestors as gods, or merely honor and respect them as men? Addison, in his excellent booklet "Chinese Ancestor Worship," asserts that the Chinese do not worship the deceased ancestors as deities (Addison, 1925, p. 52), but honor them as noble and exalted human beings. This I have found to be the belief and attitude of most of the more intelligent and enlightened Chinese in West China. For years I inquired about ancestor worship only from the more educated Chinese, and always received the same reply—the ancestors after death are human beings, highly respected, but not worshiped as gods.

One day I was talking to a servant, a Chinese who had no schooling and who was steeped in the popular ideas and beliefs of West China. I asked this man, "Do the Chinese worship their deceased ancestors as gods?" He replied, "Yes. We common Chinese have a proverb, '*Ho ti shih jen, shih liao shih shen.*'" This means, "living they are people, after death they are gods." Later the writer put the question to many other common Chinese people of West China and always received a similar answer. Scholars have also agreed that the common, uneducated Chinese of West China worship their deceased ancestors as gods, while reaffirming that the more enlightened Chinese do not.

One aspect of ancestor veneration concerns the respectful treatment of parents, grandparents, and great-grandparents while they are still alive. If they are old and helpless, they are loved, fed, clothed, and sheltered.

The funeral is very important. From late Neolithic times many things have been buried with the dead, including pottery, clothing, jades, ornaments, tools, weapons, bronzes beginning with the Shang dynasty, and bronze coins beginning in the late Chou dynasty. From early in the Shang dynasty, cattle, horses, sheep, pigs, and even human beings were buried with the dead in their tombs. During the first half of the Chou dynasty, living people were buried with the dead.

In the first half of the Chou dynasty there was a moral development among the Chinese leaders that led to protests against burying live people with the dead. This led to the substitution of wooden and straw images of men and women in the tombs. By the time of the Han dynasty, clay images were substituted for men and women, horses, cattle, sheep, pigs, chickens, ducks, geese, pigeons, houses, and stoves, and with these were buried bronzes, iron vessels, jades, money, ornaments of gold and silver, weapons, tools, and pottery vases, jugs, and dishes of many varieties.

Because of the great value of many of the objects buried with the dead in the tombs, the graves were very often robbed. The Academia Sinica during World War II excavated about 300 Han dynasty tombs in Szechwan, and the Department of Archaeology of Nanking University also excavated many, and it was found that every tomb had been opened and robbed at least once, some evidently more than once. I have not heard of a single ancient tomb in Szechwan that had not been looted, although there may have been a few.

Probably influenced by the robbery of the graves, by the time of the Sung dynasty people began to substitute paper or "spirit" money for actual coins and for lumps of gold and silver. Similar substitutions were extended to nearly all other objects, so that very little of value was buried in the graves. Instead, the objects were made of paper and wood and ceremonially burned as part of the funeral ceremonies, in the belief that burning transformed them into actual money and objects that could be used by the souls of the dead in Hades. This custom was still practiced in 1948, just before the iron curtain went down. Paper images of men and women, sedan chairs, houses, gold hills and silver hills, jinrickshas, automobiles, and many other things were burned with heaps of spirit money.

Another phase of ancestral veneration is the worship of ancestral tablets in the homes and in the ancestral temples. The Chinese believe that there are three main souls and seven lesser souls. Of the main souls, one remains in the coffin, one in the ancestral tablet, and the third goes to Heaven, Hell, Hades, or is reborn in the transmigration

of souls. It is thought that the soul of the deceased actually dwells in the ancestral tablet, and the tablet is thought of and treated as if it were the ancestor himself.

Every large family or clan has its own ancestral temple. In this there is one large tablet representing the family, and one tablet for each deceased ancestor, going back at least three generations. Generally each temple has a caretaker who daily burns incense and worships the ancestors before their tablets for the family.

Families that are too poor to have an ancestral temple keep their ancestral tablets in their own homes. In the homes as in the temples, the tablets are worshiped daily by the burning of incense and by bowing. On the first and fifteenth days of each lunar month there is special worship. Incense and candles are burned, and instead of merely bowing, the worshipers kowtow or knock their heads on the ground, a more profound act of worship.

Twice a year the family goes to the ancestral temple for very special ceremonies of ancestral worship. They kill a pig or a sheep, and chickens and ducks, which are first offered uncooked to the ancestors. The hair is cleaned off the bodies of the pig and the sheep. Holes are made in their backs, and three sticks of incense and two candles are stuck into the holes and lighted. Then there is worship and prostrations. Generally these ceremonies are performed in the homes and in the ancestral temples by the oldest sons. No women can have a part in the ancestral ceremonies.

Some families observe these ceremonies in the ancestral temples after the rice is planted and after the rice harvest. Others perform them at Ch'ing Ming and at the arrival of winter or *tung chih*. There are similar offerings in many homes at New Year and at Ch'ing Ming.

After the animals and the fowls are offered to the ancestors in the ancestral temples, they are cooked and eaten at a family meal shared by the deceased ancestors and the living descendants. The ancestors are regarded as actually present and partaking of the food. An old motto much used in West China is *chin ju chai* or *chi ju chai*, meaning "respect or worship them as actually present." A very old custom still much in use is to have a grandson of the deceased represent him at the feast.

It should be emphasized that the ancestral tablet is regarded as a living thing—the ancestor himself, and is treated as such. Before this is so, an official or scholar must perform a ceremony in which he uses a red pen and red ink and writes in the final strokes of the words *shen chu* on the ancestral tablet.

The veneration and offerings of the living descendants are absolutely necessary for the happiness and comfort of the deceased ancestors. After death they are regarded as in a very real sense alive, and as needing food, clothing, money, and many other things that they had used before death. Since only male descendants can perform these ceremonies, it is essential that in each family sons be born to continue the family line and the ancestral worship. It is therefore considered unfilial in the extreme for a son not to have sons to continue the family line and the ancestral worship.

It is believed that many of life's blessings are given to the living descendants by their deceased ancestors. These blessings include success, happiness, and prosperity of every kind. If neglected, the ancestors can inflict severe punishments upon unfilial descendants. For these reasons the ancestors are even more powerful after death than they were before.

DEMONS

We have seen that if the offerings to, and worship of, the dead ancestors are discontinued because the living descendants are unfilial or because there are no more descendants, then the deceased ancestors become hungry and angry, and vengeful, and inflict much pain and harm upon the descendants and on other people. In short, they become demons.

Another kind of a demon is the soul of a person who has died a violent or unnatural death. This includes the souls of people who have been killed by falling over a cliff, who have been stabbed or shot so that they bleed to death, whose throats have been cut, who have been drowned, who died by hanging, or of women who died during childbirth. The only way that the demon of a person who has died a violent death can escape the undesirable demon condition and be reborn as a human being is to cause some other person to die the same way that he did. There are many stories of demons trying to cause the deaths of other people.

A *tiao chin kuei* is a demon who died by hanging and who seeks to be reborn as a human being by causing some other person to die by hanging, generally by committing suicide. A *mo chin kuei* is a demon who died by cutting his throat or having his throat cut, and who endeavors to cause others to die a similar death. A water demon is one who drowned in a river, stream, or lake and now tries to drown other people. The rescue of a drowning person may anger the demon who is trying to drown that person, and the demon may then drown

the rescuer. For this reason many Chinese and non-Chinese in West China are reluctant to rescue a person from drowning. There is also the demon of a woman who died in childbirth, who endeavors to cause other women to die in childbirth.

Demons who were previously wolves, leopards, tigers and other animals are sometimes called *yao ch'i*. Among the Ch'uan Miao there are stories of demons that are the souls of vines.

Dore, in "Chinese Superstitions," vol. 5, says—

The reader can see, as in the preceding volumes, how the Chinaman peoples the world with demons and spectres. These cause illness and disease, annoy, molest, and bring all kinds of misfortune on persons and families. To protect himself from attacks on the part of these malignant beings is the great concern, we might say the almost exclusive religion of the Chinaman. (Pp. ii-iii.)

Again he says—

These inscriptions partake of the nature of charms, and are in reality devices for checking and restraining the influence of demons, ghosts, and all kinds of spectres. According to the orthodox belief entertained by Chinese philosophers, demons and spectres perform in the universe the leading part in the distribution of evil, hence the people are haunted with a continual fear of these evil-disposed beings. (P. 431.)

Belief in and fear of demons, and methods of preventing them from doing harm, are exceedingly important factors in Chinese life and religion. This adds to the importance of filial piety and ancestor worship, for practicing these virtues prevents many of the deceased ancestors from becoming harmful demons. It is also true that any person, object, ceremony, or god that can protect people from demons is regarded as very important. There are ways to keep demons from attacking a person or entering a home, and ways of removing them after they have entered or attacked.

People believe that saying the word demon is a dangerous thing. The demons may hear it and either regard the utterance of the word as calling the demons, in which case they will come and do harm, or regard the saying of the word as uncomplimentary and so become angry and harm people. It is customary to use, instead of the word *kuei*, demon, *hsi mo*, which is impersonal and means demoniacal or spooky, but it always means indirectly demons. There is a saying often used in Szechwan, "*Ssu-ch'uan ssu i ko hsi mo ti ti fang*," which means that Szechwan is a place where there are many demons.

It is believed that demons love darkness and fear and dread the light. They are very much about at night, but when the rooster crows, announcing the coming of daylight, many of the demons disappear and seek dark corners. For this reason, among others, people at

night light candles and make other lights in the homes or the temples, or on the streets. They carry torches or lanterns with them when they travel about at night. Boatmen have lights on their boats, and when ashore at night visiting or pulling the boat upstream, they carry torches or lanterns. A bride is carried by daylight to the groom's home as part of the wedding ceremony in a beautiful "flowery sedan chair." Often, as a protection from demons, lighted lanterns are tied onto the rear of the bridal chair. Bronze or brass mirrors and Chinese almanacs are also tied onto the bridal chair in the belief that they will keep away demons.

When traveling, a person often goes through shady nooks or bends where demons are likely to be, especially at night. At frequent intervals along the roads or paths there are shrines containing gods whose purpose is to protect people in that locality from demons. The gods generally found in these shrines are the local earth god called a *t'u-ti* 土地, Kuanyin the goddess of mercy, Amitabha, *T'ai-shan-shih-kan-tang*, or the T'ai Shan Stone That Dares, and *Ling-kuan*, the efficacious Taoist deity.

The inscriptions on the shrines of these wayside gods often indicate that they are there to protect from demons. For instance, an inscription often appearing on the two sides of the shrine of the *t'u-ti* means, "He protects the region so that it is quiet and lucky (free from demons), and protects in all four directions so that there is peace." Amitabha is supposed to be a compassionate god, but in a wayside shrine he is often a fierce character with tusks and so quite able to frighten away the demons. The *T'ai-shan-shih-kan-tang* seems to be a deified stone, but he is also a fierce demon chaser. *Ling-kuan* is the Taoist equivalent of the Buddhist Wei-t'o, a protector of Taoist law and temples, but he is also a fierce warrior against demons, often with his golden or iron war club uplifted and ready to strike.

Demons need to be kept out of the homes, where they may enter and harm the inmates. They are able to fly only in a straight line, so very often a high mud or brick wall is built in front of the main door to keep the demons from entering.

A very common method of protecting homes from demons is to paste paper charms above and at the center of the front door. Such charms are written or printed on paper and sold by *tuan kungs*, priests of the Wu Chiao or the religion of black magic, and by Buddhist and Taoist priests. The writer has often seen several of these charms pasted above the same door, one over the other, each

adding to the efficacy of the other charms. Sometimes instead of, or in addition to, these paper charms a mirror is hung above the door. It is said that demons are very bad looking, and when they see themselves in the mirror they are frightened at their own images and quickly depart. Another addition or substitute for the paper charms is a wooden dipper. On the convex bottom of the dipper is drawn the picture of a frightful god holding a dagger in his mouth.

Chinese front doors are in two halves and open inward. A door god is pasted on each half of the door, often with a club or other weapon uplifted and ready to strike. Their purpose is to drive away the demons that might enter the house.

Many paper charms are used inside the house to protect the inmates from demons. Some are pasted or hung up on beds to protect the sleepers, others are pasted to the altar in front and at the center of the main room. Some are in sets of four to be pasted up on each of the four sides of a room.

There are charms that are sewn onto the hats or the clothes of grown people or children to protect them from demons. Most of these are charms stamped or written on paper, but there are also brass or bronze charms called "happiness and long life money." Small brass mirrors are also used for the same purpose.

Many written charms have to do with the exorcism of demons. The inscriptions are often very hard to read, but some have the words, "Lei (thunder) cheh (cut off) er (ear)," or, "the god of thunder will cut off your ears." Another phrase sometimes found is "(it is the) orders of the most high Lao Chün." In Yunnan I have seen the horns and skull of a goat and even hornets' nests hung up as charms above the front door.

Sometimes, to exorcise a demon who is harming a person, a paper charm will be burned to ashes, the ashes mixed with water, and the water drunk. Charms may also be written with the fingers over the water, and the water drunk.

Incantations to exorcise demons are often found at the beginning and at the close of sacred books that are ceremonially chanted by Buddhist and Taoist priests. Incantations are generally understood and used only by the priests, and may either be secret and pronounced under the breath or pronounced plainly so they can be heard and understood. Sometimes phrases are used that the priest himself does not understand; these may be transliterations from the Sanskrit or from some other language.

Some incantations use words and phrases that have to do directly

with the exorcism and driving away of the demons, whereas others seem to have no relation to the exorcism of demons but are nevertheless regarded as efficacious. The firecrackers that are set off in nearly all ceremonies, including weddings and funerals, not only make a good impression, but also frighten away demons.

On the 13th, 14th, and 15th of the first lunar month the dragon parade is conducted. Strong young men with their bodies bare above their waists and wearing broad bamboo hats carry dragons several rods long through the streets and in the family courtyards. The men dance around in a circle counterclockwise. Powder mixed with particles of iron in a bamboo tube is lighted so that fire and sparks gush out, and firecrackers are set off. This ceremony is partly for amusement, but it is also believed to clear the homes and the streets of demons.

On the 15th day of the 7th moon the evil spirits in hell are released and allowed to wander around the world. There is much danger that they will do harm. Families burn quantities of spirit money for the use of these unfortunate "orphan spirits," so that they will be satisfied and will do no harm. Also on this day, but sometimes a day or two before, a Buddhist or a Taoist priest, assisted by others, performs a ceremony, chants his sacred books, and leads a procession to a nearby stream, where candles are lighted and floated down the stream on small paper boats or containers. These are lighted and released one at a time, making a long line of lights on the surface of the water. This is done to entice the orphan spirits or demons away from that locality.

When requested to do so, or in times of danger, during a pestilence, or when praying for rain, the Buddhist or Taoist priests conduct elaborate ceremonies. They chant their sacred books, repeat incantations, and burn spirit money as a means of exorcising demons. Sometimes during these and other ceremonies the priest blows a conch shell to call the demons to him so that he can then drive them away. There are said to be rabbit demons that squeal in a peculiar way. Duck demons quack on the ponds, rice paddies, or streams, but if a person looks for them, no ducks are to be seen.

In almost every funeral procession one man carries a basket full of incense and spirit money, some of which he burns at every shrine in worship of the gods. Every few rods he throws out some spirit money for the demons so they will do no harm. Demons are said to be afraid of fishermen, fearing to be caught in their nets.

When a child is sick, it is believed that he is being attacked by a

demon who wishes to take his life. In an effort to save the child's life, the parents will sometimes invite a traveler who happens to be passing by to come into the home and give the child a new name. The traveler is given a meal and some tea, and he gives the child a new name. The traveler and the parents worship the family gods together. It is believed that giving the child a new name may save its life.

Demons are supposed to fear blood, and in many ceremonies of exorcism blood is sprinkled to frighten them away. When boatmen are about to begin a journey, they kill a chicken, offer it in worship to Wang Yeh, the boatmen's god, and sprinkle some of the blood on the front of the boat. Blood is also sprinkled when a new business is opened, when a business is reopened after New Year, or when a new house or other building has been finished. All this is to exorcise demons. Other ways to frighten away demons are to throw *tsai pao*, which are round biscuits, to sprinkle holy water, and to throw uncooked rice.

Sometimes when a person has a pain in his head, his chest, or his intestines, he will take a boiled egg and roll it back and forth on the ailing spot. Then he will take the egg to a specialist who, after looking at it, tells him which demon is causing the trouble and how to get rid of the demon. Some of the methods suggested are to burn spirit money, to pour water and rice on the ground in front of the house, or to call a *tuan kung*, who will kill a chicken, burn spirit money, offer wine and pork, speak some good words to the demon, or possibly scold the demon and order him to depart. The *tuan kungs*, as well as Buddhist and Taoist priests, earn much of their income exorcising demons.

When a person is insane, acting and speaking in peculiar ways, it is believed that he is possessed by a demon. This is the basis of the statement sometimes made by Chinese and by foreigners that demon-possession exists in China. It is also believed that deceased ancestors sometimes take possession of living descendants and give messages through them to other living descendants.

The fear of demons in West China can hardly be exaggerated, as is illustrated by the following story: Two American women were on a boat on the Min River between Lo-shan and I-pin. As there was danger of robbers, they stopped for the night in the vicinity of a small town. After a time they heard a band of robbers noisily robbing other boats and gradually approaching their boat. One woman was afraid, but the other said, "Never mind. You leave this to me." Then she took out her false teeth, exposing her few remaining teeth, and

mussed up her white hair. When the robbers approached the door of the boat, she took a lantern in her hand, thrust her head outside the door, opened her mouth wide, and held the lantern in front of her face. The frightened robbers shouted "kuei" (demon), ran away as fast as they could, and did not return. Although armed with guns, they were afraid of this foreign demon.

CEREMONIES TO OBTAIN SONS

From the dawn of history a major desire of the Chinese has been for numerous descendants, sons being more desired than daughters. One reason that sons are preferred is found in the *yin-yang* philosophy, which has been accepted by all. As stated above, *yin* is female, and is dark, dull, inferior, the source of evil and undesirable things, while *yang* is male, bright, intelligent, superior, the source of all good and desirable things. Sons are also economically more valuable to the family than daughters. At marriage the daughter must be given an expensive dowry, which is really a gift by her family to that of the husband. The ancestral ceremonies of worship and commemoration must be continued generation after generation, but only sons can perform these ceremonies, women having no part in them. A woman's social prestige rises greatly after she has given birth to a son; therefore sons are greatly desired and are prayed for, but families almost never pray for daughters.

One of the most common ways to obtain sons from the gods is as follows: In most temples there are gods or goddesses who are believed to give sons. Among the most common are Sung-tzu-kuan-yin, or the Kuanyin that Gives Sons, and Sung-tzu-niang-niang, or the Woman who Gives Sons. A person or persons wishing sons to be born in the family will worship one of these deities, very likely presenting a gift, and request that the deity give a son to his family. He or she also promises that if a son is given, the suppliant will give a son to the deity in return. If a son is born in the family, a wooden or a clay image of a boy is presented to the god and left on his shrine. Another person wishing to obtain a son will "steal" one of these images of a boy and take it home, which he believes will cause a son to be born in that family. If a son is born, the image of the boy is returned to the shrine of the god, to be taken later by a member of another family that desires a son. The more images of boys there are on the shrine of a god, the more famous the god is as a giver of sons, for these images are evidences of such gifts.

Another very common method is for the suppliant to go to the

temple, worship the god at his shrine, beseech the god to give a son, and promise that if the son is given the suppliant will make a gift to the god or to the temple. If the son is born, the vow is fulfilled.

In some Buddhist temples there is an image of a sleeping Buddha. The image is reclining on a bed or couch, clothed and covered with quilts. One who desires a son "steals" a garment or a quilt of the god and takes it home, where the woman who wants a son sleeps under it at night. This is supposed to cause her to conceive and to bear a son. After a son is born, the property is returned to the god.

On the sides of cliffs or overhanging rocks in West China are occasionally seen small, round natural holes in the rock, from 1 to 2 feet in diameter. Some of these are called *ta-er-o*, or strike-son holes. When men who want sons to be born in their families pass by one of these holes, they throw stones at the hole. It is believed that if a man throws a stone into one of these holes, a son will be born to his wife. There is such a hole at the Taoist temple Tao-ssu-kuan, between I-pin and Lo-shan on the Min River, one near P'in-shan on the Yangtse River west of I-pin, and one near Sha-ho-i, south of I-pin.

Sometimes during a marriage procession people place biscuits or small cakes in the sedan chair of the bride. When she arrives at her new home, they are placed on her bed. Other women pilfer them and eat them, which is supposed to enable them to give birth to sons.

On one of the high hills above I-pin a small temple was built in 1925, called the Yü-hsien-miao, or Meet Immortal Temple. Some Chinese men were walking near this spot and saw a beggar lying on the ground. It was raining and the ground was wet. Later the beggar had disappeared, and the ground where he had been lying was dry. This was regarded as evidence that the beggar was an immortal. The men therefore caused the new temple to be built near the spot where the beggar had been lying. Besides the goddess who heals measles and smallpox, nearly all the other gods who were placed in the temple had to do with the giving or the birth of sons. These included the Sung-tzu-kuan-yin, the Sung-tzu-niang-niang, the Ts'uai-shen-niang-niang, the Chi'i-lin-sung-tzu or the Kirin who gives sons, the t'u-ti-sung-tzu, and the Sung-tzu-lung-wang or the Dragon King who gives sons. People come at the time of the annual festival, which is in January, and ask the gods for sons. If sons are born during the coming year, at the next festival they bring eggs that are painted or dyed red to give to the gods. Other people who desire sons come to the festival, and on the way to the temple or from the shrines in front of the

gods they snatch or "steal" the red eggs and take them home. They are given or sold to women who desire sons, who eat the eggs, expecting this to cause them to become pregnant and bear sons. Thousands come to this festival every year, in a constant stream of humanity going up and down the mountain, some to see the sights, and others to "steal" eggs and to obtain sons.

CEREMONIES TO CAUSE OR TO STOP RAIN

Some occidentals describe all ceremonies to cause rain as praying for rain. As an actual fact, only a fraction of such ceremonies are petitions; the others are believed to have magical power to cause rain. The Chinese expression is *ch'iu yü* 求雨. The word "pray" as Christians use the word is generally *tao kao* 禱告. The word *ch'iu* is broader, and includes to ask for, to beseech, to beg for, and also to seek, to wish for, and to aim at (Giles, 1892, pp. 243-244; Williams, S. Wells, 1909, p. 170).

In an agricultural country like China, in which formerly more than 85 percent of the population were farmers and lived on farms, rain is exceedingly important. Without rain, crops fail, prices soar, and famine comes. On the other hand, too much cloudy weather injures the crops, and too much rain causes floods and sometimes famines.

The cause of the drought or flood is believed to be explained by the *yin* and the *yang*. The *yin* is dark and cold, and is associated with rain. The *yang* is warm and bright, and is associated with dry, sunny weather. Too much *yang* and too little *yin* causes drought, and too much *yin* and too little *yang* may cause heavy rains and floods. When a region is threatened by, or in the midst of, drought and wishes to take measures to bring rain, the leading magistrate is responsible for promoting the process. He issues a proclamation ordering a fast and directing that ceremonies to seek rain be conducted. Generally he himself goes to one or more temples, sometimes several times, and prays to several of the gods that might be expected to send rain.

About the year 1940, a magistrate in Szechwan in a region suffering from drought was requested by the people to proclaim a fast and a period of "praying for" rain. He was an enlightened man and declined to do so, saying that the methods used were all superstitions and that rain would come just as soon if people simply waited for it. A mob of country people went to the yamen, almost caused a riot, and compelled him to act.

About the same year there was a drought in Wen-Ch'uan-hsien.

The magistrate went to a temple near a lake on a high mountain and prayed earnestly to the Dragon God for rain. After a time it began to rain. Then he walked down the mountain toward Wen-ch'uan-hsien with his hands and arms outstretched as though he were taking the rain down into the valley with him. The rain actually went down into the valley, ending the drought. It seemed obvious to the people that his prayer caused the rain and that he brought it with him into the valley. They believed that to be able to do this, he must have very great virtue. The next year he tried to end a drought in the same way, but he failed and thereby lost his reputation.

One year there was a serious drought at Ch'ang-ning-hsien, south of I-pin. The magistrate went to the temple called P'u-t'ao-ching or Grape Well. In this temple were several dragon gods. The temple was in bad condition and needed repairs and painting. The magistrate reverently worshiped all the gods and prayed for rain, promising or vowing that if there should be rain that night he would repair and repaint the temple and give the gods new clothing (new coats of paint). That night there was a thunderstorm with torrents of rain that filled the rice paddies and broke the drought. The magistrate kept his promise and repaired and repainted the temple and the images of the gods.

Often, when seeking rain, the magistrate and the priests or other people worship the gods in the temples and make verbal prayers. Nearly always the request is accompanied by a vow or a promise to give something to, or to do something for, the god or gods if the prayer is answered. Often, too, the prayer is written on paper in the form of a letter and burned as the accepted means of sending it to the god. On March 23, 1929, at Hsü-chiang, west of I-pin, while the people were praying for rain, 12 such letters were written and burned to 12 different gods.

Six of the main gods that are worshiped in order to obtain rain are the Dragon God; Wang Yeh, the god of rivers and boatmen; the water god; the god of thunder; the god of agriculture; and the *t'u-ti*, or local deity. Several other gods are often worshiped for this purpose.

Whenever a community decides to use extraordinary means to bring rain, a period of fasting is proclaimed and strictly observed. This means that no birds, fish, or animals can be killed, and no meat can be eaten, not even eggs. Even criminals can not be executed. Back of this practice is belief in the Buddhist doctrine of Karma and transmigration. Karma refers to the law of cause and effect, which has a bearing on the transmigration of souls. What a person or a creature

is in this existence has been determined by his conduct in previous existences. The good or evil which he does in this existence will determine how he is reborn after death—as an insect, a reptile, a bird, an animal, a woman, or a man, and what kind of a man—rich or poor, high or low. This means that any creature may have been a human being in a previous existence, so that devout Buddhists are sometimes vegetarians, and many believe that it is nearly as bad to kill any creature, even an insect, as to kill a human being. Abstaining from killing and from eating meat and eggs is supposed to move the gods so that they are more likely to cause rain.

One method used to bring rain is to close the south gate of a city so that the *yang* influences cannot enter. If there is too much rain and cloudy weather, the north gate is closed to prevent the *yin* influences from entering. Another method is to fire guns. It is believed that the reason for the drought may be that the dragon has overslept and so forgotten to send rain. Firing off guns is supposed to be especially efficient near lakes or ponds or on high mountains, for the dragons live in such localities. When going over high passes in West China, natives have requested me not to fire my gun lest it should cause rain.

In 1928 I visited Ningyuenfu, now called Chien-ch'ang. One day I went out on a nearby lake with a Miao hunter and fired about 50 shots with a shotgun. On our way back into the city we were caught in a downpour of rain. The next day we again went out on the lake and fired many times, and again were caught in a heavy shower of rain, which continued for three days, breaking the drought and saving the crops. The people in and around Ningyuenfu said that I had broken the drought by shooting on the lake and were glad that I had come.

An important means of seeking rain is the ceremonial chanting of the sacred books. It is called *nien ching*, or reading the sacred books, but actually they are always chanted or sung. The books chanted are generally those of the Dragon King or the Water God, those of the local god or *t'u-ti*, or those of Wang Yeh, the god of boatmen and of rivers, but the sacred books of other gods may be used. In these sacred books there are incantations to purify the body, the mind or heart, and the mouths of the priests, but there is generally very little praying and sometimes none at all. For a Buddhist or a Taoist priest to repeat or chant the sacred books ceremonially is regarded as a very meritorious act that may move the gods and therefore cause rain. It is primarily magic instead of prayer.

Yet another method of seeking rain is by means of the dragon

parade, which is in some ways similar to the one described later in the section headed "The Chinese Lunar Festivals." The men carrying the dragon wear wreaths of green willow twigs on their heads, for it is believed that since willows grow near streams and lakes they possess magic power to cause rain. As the dragon goes down the streets, it does not turn in circles counterclockwise, but undulates from one side to the other like a snake. Firecrackers are set off, and men in the procession throw water on the bystanders; and the spectators in turn throw water on the men in the procession and on the dragon. This is imitative magic—hoping to obtain rain by throwing water in imitation of rain.

Another method that the writer has seen is to have a parade in which a black dog and a white dog are carried, each sitting in a sedan chair and each wearing a hat and spectacles. Two beggars walk beside the dogs, pretending that they are going to marry the dogs. As the procession moves along, the onlookers laugh very loudly. It is believed that the procession and the loud laughter will cause rain. Grainger (1921, p. 70) quotes a saying, "If you laugh at a dog, rain will fall."

It sometimes happens that a drought is so prolonged that all these methods fail to bring rain. Then, in desperation, the god who should give rain is placed in the street or in a park where he is exposed to the broiling hot sun, in the belief that his suffering will cause him to have pity on the people and send rain.

One year in Lo-shan the exposure of the image of the god in the sun failed to bring rain, and the priest persuaded the people that the god was angry because he was treated badly and induced them to permit him to take the idol back into the temple. The priest then humbly and respectfully worshiped the god, and soon there was rain. It was believed that the god first refused to send rain because he was angry, but later was persuaded to do so by courteous and respectful treatment.

Sometimes when there is a flood, men will shoot bullets into the flooded river, believing that it will help bring an end to the flood. Other methods very widely used are the closing of the north gates of cities and towns, and the worship of the sun god by magistrates and other people (*ibid.*, pp. 69-70).

DIVINATION AND FORTUNETELLING

As we have seen, divination is one of the oldest customs among the Chinese. With its corollary, fortunetelling, it is very commonly

practiced among all ethnic groups in West China, including the Chinese. It is used on practically every important occasion and sometimes merely out of curiosity.

Divination is resorted to before sending a go-between to make an engagement, after receiving the horoscope of the young woman to whom a proposal has been made, in order to determine a lucky day and hour for a wedding or a funeral, before beginning a journey, before opening a store or shop to begin business, before starting to erect a building or making a sale, to learn whether a sick person will get well or not, and for many other purposes.

Blind people are supposed to be able to see and know many things which to ordinary people are invisible; hence they are believed to be very efficient in telling fortunes. The blind person sometimes works at home, sometimes while sitting at a table on a busy street. Generally he has a helper who can see, to lead him when he is walking about, and who by secret signs tells him whether the inquirer is old or young, rich or poor, and other desirable information which enables him to tell an appropriate fortune. Sometimes the fortuneteller feels the palms of the inquirer, sometimes he feels the bones, and sometimes he merely talks.

One way of divining is to throw bean sprouts into a pan of water. By noting the shadows beneath the sprouts, a person foretells coming events.

Astrology has a large part in Chinese divination. It is believed that climatic changes are related to the moral conduct of the people and that the sun, moon, and stars are the means by which these changes are produced. Into this theory the principle of the *yin* and *yang* has been incorporated, as well as the theory of the five elements. The sun is the *t'ai yang*, or the greater *yang*, the moon is the *t'ai yin*, or the greater *yin*. The planets collectively are the *shao yang*, or the lesser *yang*, and the fixed stars are the *shao yin*. The horizon is divided into 12 sectors named after the 12 branches. The 12 hours of the day correspond to these 12 sectors. "The ecliptic is divided into 28 lunar asterisms or constellations. Each of the azimuth and ecliptic divisions has affinities with the elements (planets) and is *yin* or *yang*. From this point the system has proceeded rather arbitrarily." (Couling, 1917, p. 38.) Attention has been concentrated on determining fortunate days and hours, and these are recorded in the yearly almanac. This explains, also, the use of the horoscope.

One way to divine is to consult a Buddhist or a Taoist priest. In 1925 there was civil war in Szechwan, and one warlord consulted a

Buddhist priest, while a rival warlord consulted a Taoist priest, each to learn whether his fortune would be good in case of war. Near the end of the Manchu dynasty, according to a Suifu tradition, a famous Buddhist priest from Suifu called Liao Ming Ho-shang became the special diviner of the imperial family. Yuan Shih-k'ai, then a prominent official, also consulted him. He was told that he might become Emperor of China. Yuan quickly hushed the priest up but secretly gave him much money. After the Manchu dynasty had fallen and Yuan had become President of China, he again consulted Liao, who repeated his statement that Yuan could succeed in becoming Emperor. After Yuan had failed and died, a Chinese official in Lu-chow, Szechwan, gave Liao a public beating for his part in encouraging Yuan to try to overthrow the Chinese Republic and establish an empire with himself as emperor. Liao went into hiding and was never heard of afterward.

A very common way of divination is by means of the *yin-yang kua*, which consists of two pieces of dried and lacquered bamboo roots. One root is cut into two halves so that each half has a flat surface and a round surface. The flat side is *yang* and the round surface is *yin*. The inquirer first worships the idol, with bowings or prostrations, and burns incense. Then the priest throws the *yin-yang kua* onto the ground or the floor. If the two round sides land up, it is unlucky; if the two flat sides are up, it is lucky; and if one flat side and one round side are up, it is neutral. If the results are unsatisfactory, the worshiper will again worship the god and make a vow, promising a gift to the god or the temple, and the priest throws again. The priest keeps throwing and the worshiper making larger vows until the two flat sides come up, when the divining ceases. They believe that the god has changed the fortune of the worshiper from bad to good because of his worshiping and making vows, and the vows are always paid.

In front of some images are tubes or cylinders containing 100 bamboo sticks numbered consecutively from 1 to 100. Nearby are also 100 sheets of paper numbered the same way. On each sheet a fortune is printed, varying from very bad to bad, medium bad, medium, medium good, very good, and the very best. The inquirer first worships the god, then kneeling in worship, he shakes the tube containing the bamboo sticks until one falls out. The priest looks at the number on the stick, then gives the worshiper the sheet of paper having that number. The inquirer reads what is written on the sheet of paper and believes that it tells his fortune. Sometimes the *yin-yang kua* is also used.

I remember an uneducated Chinese laborer who, after using the sticks, drew one of the "very best." He was much elated. Gen. Chang Ch'ün, once the Governor of Szechwan and later Premier of China, whose whole family was Christian, went to a temple in company with his wife, his son, and his son's fiancée, to consult the divining-sticks. All drew excellent fortunes but the fiancée, who was then not popular with her prospective parents-in-law. Some wondered if the priest had been able somehow to manipulate the divining-sticks.

I have a collection of the papers which are used in temples with the bamboo sticks for divination. Below are translations of three of these, made by me with the help of Wayne Kow, a graduate of Denver University.

MOST LUCKY

If you walk along, dignified, toward the clouds, you belong to the first class among ten thousand officers, at the court made of precious stones. The gods give you wealth, honor, glory and prosperity, happiness like the Eastern Ocean, long life like a mountain.

The holy meaning.—You will attain honor and fame. Your happiness and wealth will be complete. In litigation you will get right results. If sick, you will recover. Your mulberries and hemp will mature. Your marriage will be round (satisfactory). Pregnancy will give you a son. Travelers will come back home.

Explanation by Tung P'u.—You walk along in clouds (you will be distinguished above others). Your name will be at the top of the list. You smile while you talk with honor (for you have it). You will be distinguished all of your life. All is given by Heaven. You will attain high position and you will live very long. What you want will be fulfilled, and what you plan will be attained.

Explanation by Pi Hsien.—You will climb the *tan kuei* tree (in the moon) (you will attain high honors). You will gain fame while walking in a yard of precious stones. What you are seeking you will get completely. There is no doubt you will be satisfied with 10,000 things.

Explanation.—This divining-stick means that the plan is complete. Business is successful. In nothing are you a failure. But each has its own purpose. If an officer gets this he will have the good fortune of promotion. If a scholar gets this he will have the luck of reputation and honor. To a person seeking his fortune this will bring happiness and longevity forever. To a person looking for success in business, this shows he will have a very good foundation. If a person is looking for wealth, this is good only in words, not in fact, for the meaning of the words is only superficial.

Illustration.—By the clouds, it means high above the clouds. "Walk lonely and dignified" means step on the blue clouds. "A thousand officers at a court made of precious stones" means angels in heaven. This means the most honorable angel that is in the first class. "Glory, prosperity, wealth, and honor executed by heaven" means heaven has already given. It naturally means happiness and longevity without end. "Like an ocean" means the expansion and spread of happiness. "Like a mountain" means eternity and solidarity of longevity.

This sign, most lucky, can be applied only when man and place fit together (both most lucky).

Proof.—A scholar asked about his honor and reputation and got this divining-stick. He said that he would get the first or the second place. After a long time he passed his entrance examination. In the second test, the court test, he was at the top of the list and therefore he was given an office in Shantung Province. From the county administrator (at the bottom) there is the Chou official, then the prefectural official, then the *Ts'i* official, then the *Tao* official (the viceroy), but all were in Shantung Province. It came in response from the last sentence, so altogether this divining-stick had the right response, but also had the opposite response, both positive and negative. The positive response means the highest place in the examination, advance in high position, eternity of wealth, honor, happiness, and longevity. It is unknown in the negative response (that is, how far from the highest). The one who has divined will have to consider his ability and spirit, and his personality, and the situation as it exists. He will know the dexterity of the positive and negative responses. At the second examination in the year of *Ping Wu* my friend from the same town, Yen Shih-p'ei, got this divining-stick. He wasn't in the list when the bulletin was posted. Early in the sixth moon he went back to Han-Sang. He died of sickness a few days later.

Comments on another divining-stick:

MOST UNLUCKY

It may seem that all good things this year are turning out very brightly; wealth, honor, glory, and prosperity will come to you, who knows the uncertainty of the future. Ultimately you stand alone and begin to feel sorry.

Holy meaning.—Do not over desire. Fame or reputation will not come. Wealth will come about average. You will be at a disadvantage in litigation. Sickness will be fatal. Things will not turn out well. In traveling you will encounter hindrances.

Explanation by Tung P'u.—Destiny will be hard to be right.

NO. 90, MEDIUM

The price of crops this year is not as good as last year. But the prices of other commodities rise 100,000 times. There is a prevailing calamity, and many epidemics. Wait until the turn of another year and it will be all right.

You will have many lawsuits and they will continue a long time. You will have many sicknesses, and at the end you will be without injury. Wealth and honor will be hard to get. You wait for the time to come. This divining-stick is not so good as before. Furthermore, you will have unexpected troubles. You will have quarrels; in a long time they will clear up. Wealth is also hard to get. Do not take everything too easy. This divining-stick appears as if there is help. All the hungry appreciate the salvation. Although people suffer severely from calamities, by benevolence they spread all over the kingdom.

All priests and fortunetellers are paid for their services. Often they are paid more generously if the fortunes they tell are good.

INCANTATIONS AND CHARMS

Incantations are widely used in West China, both by priests and by laymen. Sometimes they are employed to wreak vengeance on an enemy. I once saw an instance of this. Someone had stolen a chicken from a Chinese farmer's wife, whose house was near the road. In anger she went outside the house, looked up toward the sky, and called upon the god of the sky to bring harm upon the thief. The severity of her curse shocked the Chinese men who heard it.

Among the Lolos an incantation is regarded as so powerful, especially when pronounced by a priest, that it often causes death unless it is counteracted by another priest using another incantation.

Many sacred books, which are ceremonially read or chanted by Buddhist or Taoist priests, or by *tuan kungs*, begin with incantations. These, among other purposes, are to purify the mouth, the body, and the mind or heart of the priest, and to pacify the local deity who is called the *t'u-ti*, or earth god.

Incantations are used in ceremonies of exorcism, of which the following is an example. It is a Chinese incantation obtained in the Chinese language from a Ch'iang priest.

The *t'u-ti* of the east, the *t'u-ti* of the south, the *t'u-ti* of the west, the *t'u-ti* of the north, the *t'u-ti* of the bridge beams, the *t'u-ti's* at the gate of the temple, the *t'u-ti* of the sky lamppost, the 24 *t'u-ti's* beside the roads, the demons of people who have died at night, the demons of people who have died at daytime, the demons of tree stumps, the demons of people who have committed suicide by cutting their throats, the demons of people who have drowned in rivers, the demons of those who have died violent deaths, or have bled to death, the demons of exorcists whose souls are wandering, the demons of Taoists whose souls are wandering, the wandering demons of carpenters, the wandering demons of blacksmiths. Sir, I have bumped against the head of the horse that you are riding, and against the tail of the horse that you are riding (to prevent your departure). I will give you money of gold, silver, and brass. I will present you a tray of flowers. There is little water, but the money and the rice are plentiful. Come from the east and return to the east, come from the south and return to the south, come from the west and return to the west, come from the north and return to the north, When you come, do not deceive me, this apprentice magician, or the others who have come (to look on). I have received the strict orders of the most high Lao Chün, like a legal command. I, the apprentice magician, having in my mouth 36 teeth, carrying 28 swords in my hands, can see 3,000 *li* distant and 800 *li* near. Master Nien Wang, and the Official Recorder in Hell, the small demons in hell, you can see that my eyes are large and bright (with fierceness); I, the apprentice magician, holding in my hands 1,000 clubs as white as jade, first, I will not strike the sky, second, I will not strike the earth, I will strike straight at you demoniacal spooks and demons. Let the poisonous breath of the sky return to the sky, and the poisonous air of the earth return to the earth, also the poisonous year air, the poisonous

month air, the poisonous day air and the poisonous hour air, and the evil breath of 120 fierce gods. Chiang T'ai Kung has arrived here. First, I will escort you 1,000 *li*; second, I will escort you 2,000 *li*; third, I will escort you 3,000 *li*; fourth, I will escort you 4,000 *li*, and fifth, I will escort you 5,000 *li*. Escorting you once, I will escort you to the nests of the sky and the earth (where you will be caught) so you cannot return again. I am acting in accordance with the orders of the most high Lao Chün which are like law. (Graham, 1954b, p. 65.)

Dore says (1914-1931, vol. 2, pp. 157, 160) that the drawing of charms is one of the chief pursuits of Taoist priests, and that Buddhist monks imitate the Taoists. The *tuan kungs* also write, print, and use many charms. In the preface of volume 2 (p. iv) it is stated that "a charm is a device of religious magic, an instrument for reducing spectres to submission, disarming them, counteracting their evil influences, and preventing them from injuring man in his present and future life." In volumes 1, 2, and 3, Dore pictures in color many written and printed charms on paper, used for a variety of purposes. He also states that as an official proclamation is feared and obeyed because of the official seal, hence every paper charm has the seal of a deity, causing demons and spectres to fear and obey them. It is further stated that "The popular mind peoples the world with spirits, demons, and spectres. The struggle with this spiritual world constitutes chiefly the religion of the masses. The charm has been adopted as a device to rally the gods to the assistance of man, and help him overcome the power of evil." (Vol. 2, pp. v-vi.)

Most written charms, by their seals or the wording of their inscriptions, are believed to use the power of some god or gods. Most of them are on yellow paper, in imitation of the official proclamation during the Manchu dynasty. A large proportion of the charms are to protect from, or exorcise, demons, or to put an end to the harm that they are doing.

Blood, believed to be efficacious in exorcising demons, is sometimes seen splashed on doors and charms. The most efficacious is human blood, but, of course, it is rarely used. Next best is chicken blood, which is used a great deal, and less efficacious is duck blood.

Two very important designs on charms are the *pa kua* or eight trigrams and the picture of the *yin-yang* or the *T'ai-chi-t'u*. The latter is circular in shape, and the eight trigrams are arranged to form a hexagram. Sometimes the two are used separately, sometimes combined by placing the *T'ai-chi-t'u* inside the *pa kua*. Separately or combined, they are believed to have superhuman potency, and they are often used on charms. They may be a part or the whole of the charm.

Knives, swords, and daggers are sometimes used as charms. They are believed to be especially efficacious after they have been used to execute criminals or to kill somebody. Wooden swords, knives, and daggers are sometimes made and hung up above doors as charms, to keep away demons. I have seen this done by Tibetans and by Ch'uan Miao.

An unusual substance used as a charm is amber. It is transparent and sparkling, and can pick up bits of paper. The amber sometimes encloses leaves, bits of grass, or insects, and is therefore assumed to possess potency through use as a charm. Often a hole is drilled through a small piece of amber, and it is hung around the neck by a string drawn through the hole.

Red Cross emblems on flags were first used in I-pin in 1916 and in other parts of West China about the same time. Generally they were used in connection with hospitals and dispensaries. The common people got the idea that there was special power in the Red Cross emblem and began to make small red crosses of cloth and to sew them onto the clothing of children to keep away demons.

A small silver charm sometimes worn on a child's hat, in the center above the forehead, is a silver replica, about 1½ inches in diameter, of the round, flat bamboo basket used for winnowing or for sewing. In it are tiny silver imitations of a pair of scissors, a Chinese flatiron, a ruler, an almanac, an abacus, and a small object used for ironing clothing in small and difficult places. These are among the most commonly used objects in Chinese homes and so are assumed to have special potency. Here is an example of the fact that among primitive people the most useful objects are likely to be sacred and regarded as having superhuman power.

When parents fear that a son may die, they sometimes call in a Buddhist or a Taoist priest who puts a chain or a wire around the child's neck or his arm, using a lock to fasten it on. It is believed that this may keep the child from dying.

Sometimes a boy whose mother has died takes a lock of her hair and ties it around his neck in the belief that this will protect him from demons. Small silver images of Buddha or of the 18 arhats are seen on the hats of boys as talismans.

As jade is supposed to have potency, many charms are made of this substance. Jade cicadas that were placed in the mouths of the dead have been found in Han dynasty tombs throughout China.

A common charm is the *fu-shou-ch'ien*, or "happiness and long life charm." It is generally made of bronze, but sometimes of brass

or copper, is round with a square hole in the center, and is about 2 inches in diameter. On it are sometimes good-luck phrases such as *hao yün lin shen*, or "may good luck fall on his body," and *chin lu chia kuan*, or "enter into fortune, advance in official rank." A typical charm of this kind to ward off demons has on it the inscription, "The order of Lao Tzu. Use this to kill demons, subjugate spooks, behead phantoms, avoid evil influences, and forever guarantee safety." (Graham, 1928b, pp. 40-41.) Happiness and long-life coins are often sewed on the back of boys' hats.

I have seen swords on the blades of which were seven round gold or copper dots representing the seven stars of the Big Dipper. Such swords are thought to be good charms, for the seven stars of the Big Dipper are believed to have potency. The Chinese lunar calendar is sometimes used as a charm to ward off demons. As such it is used on bridal chairs in wedding processions.

On occasion, a priest or some other person will write a charm with his fingers or with a pen over water, and the water is then drunk by the patient needing healing. Or the charm may be written in the air over a boiled egg and the egg given to the patient to eat.

Some charms are four-line verses written on red paper and pasted up in convenient places for people to see and read. These do not have seals of gods or temples to add to their efficacy, but they are efficacious if people read them or if the sun shines on them. The most common of these is a verse to cause babies to cease crying and to sleep at night so that the older members of the family can sleep. Below are a few examples.

The sky is bright and the earth is bright.
We have a baby that cries at night.
If the passerby will read this right,
He'll sleep all night till broad daylight. (Ibid., p. 39.)

A variation of this is,

The sky is bright, the earth is green.
Our small son cries easily.
Please, gentlemen, read this through,
(and) I'll thank you and wish you ten thousand happinesses.

Another says,

The sky is yellow, the earth green.
Our small son cries at night.
Let all gentlemen read this through,
And he will sleep until the sun rises (comes out).

Still another,

The sky is bright, the earth is bright.
Our family has a crybaby.
If passersby read this three times,
He'll sleep until the sun comes out.

Another of a different kind says,

My nose is stopped up, swollen large.
I have a cold.
If anyone looks at this, he will carry the cold
Into his own home.

Another is to change an unlucky dream into a lucky omen :

At night I had an unlucky dream.
I paste this on the east wall.
When the sun shines on it.
It will be changed into a lucky omen.

Another charm says,

My night dream is unlucky.
I write this (or paste it up) beside the road.
When the sun shines upon it,
It will be transformed to lucky and prosperous.

Another says,

My eye winks in an unlucky way.
I paste this on the east wall.
When the sun shines upon it,
It will be changed into lucky.

By far the largest number of charms in West China are written or printed on paper, generally yellow in imitation of the official proclamation, and generally but not always containing seals of gods in imitation of official seals. In these charms there are used strange and fanciful ways of writing characters or parts of characters, making them difficult for an ordinary sinologist to read and to understand. Dore has explained some of these in volume 2 of "Chinese Superstitions" (Dore, 1914-1931, vol. 2, pp. viii-xxii).

Written and printed charms vary in respect to size, inscriptions, and usage. Of those that are written with pen and ink, I have seen some that are little more than blotches, while others are works of art in penmanship and drawing. For those that are printed, the charms are first written or printed on hard wood, then the wood is carved, and the carved wood is used to print many charms. More rarely the seals or charms are made of metal, usually iron. The charms vary in size

from about $1\frac{1}{2}$ inches wide and 6 inches long, to over $1\frac{1}{2}$ feet wide and 2 feet long. While some seem carelessly done, others are artistic and more nearly perfect.

Dore, in "Chinese Superstitions," volumes 1 to 3, shows many charms in color and tells of their uses, but even this work is not nearly exhaustive. While a large proportion of these charms have to do with protecting from demons, driving them away, and removing their effects, there are also many other uses. One is inclined to say that there are few situations in which a person is in distress and needing help for which there is not a charm to provide this help.

Among many people in West China, great potency is ascribed to that which cannot be understood, as for example the incantations transliterated from foreign languages and charms written so strangely that an ordinary person cannot read and understand them. Sometimes the little that can be understood enhances this belief. For instance, I have seen charms, parts of which could be understood to read, "(the god of) thunder (will) cut off (your) ears." This is believed to inspire fear in the demons, for the god of thunder is very powerful, and nobody wants his ears cut off.

In short, incantations and charms are supposed to make use of superhuman potency, often by the help of the gods, to accomplish desired results.

THE CHINESE LUNAR FESTIVALS

The Chinese word for festival is *chieh ch'i*. *Chieh* means joint or node, or limit of time, and *ch'i* means air or breath. Prof. Lewis Hodous explains the words *chieh ch'i* as meaning "a joint or node, which marks the critical time in the breathing of nature when it passes from one mood to another." (Hodous, 1929, p. 1.) Many centuries ago the Chinese divided the year into 12 lunar months of 30 days each, and into 24 periods of 15 days each, which are called "joints and breaths of the year." (Bredon and Mitrophanow, 1927, p. 18.) Some lunar festivals are much more important than others, and we shall describe briefly only the most important ones.

The New Year is by far the most important Chinese festival. It is a time for family reunions, and every member of the family who possibly can comes home to *kuo nien*, to pass the New Year season with the rest of the family.

Throughout the year the kitchen god rules over the affairs of the home from his throne in the kitchen, keeping careful watch over the industry, the economy, and the morals of the home. The inmates are

expected to be industrious, economical, and morally good. On the 23d day of the 11th moon he ascends to Heaven and gives a full and careful account to the Jade (Pearly) Emperor. With much ceremony his image, which is printed on paper and hung or pasted up in the kitchen, is taken down and burned. The image is worshiped, incense and candles are lighted, firecrackers are set off, and a letter to the kitchen god is written on paper and burned, requesting him to overlook the shortcomings of the family and make a favorable report. Generally a package called a *chao ma* is burned, on which is the image of a horse for the kitchen god to ride up to Heaven, and in which are some beans and bits of straw for the horse to eat. Sometimes taffy is given to the kitchen god. One explanation is that it is to make his lips stick together so that he cannot make an unfavorable report, and another is that it is to cause him to speak sweet words in his report.

Between the 25th day of the 12th moon and the 2d day of the 1st moon, generally on the 29th or 30th of the 12th moon, there is a family meal. The best food obtainable is provided, for the kitchen god is not present to require economy. Every member of the family is expected to be present, those who are away going home if it is at all possible. It is also believed that the spirits of the deceased ancestors are present and share in the feast.

At a convenient time before New Year's day, the front door of each house is decorated by pasting above and down both sides wide strips of red paper. On these are written in large characters statements or mottoes expressing the fondest hopes of the family. Among these are *nien nien fa ts'ai*, or "grow richer year by year"; *Shen I hsin lung*, or "may our business prosper"; *fu kuei shuang ch'uan*, "may wealth and honor both be complete"; and *Cheng chai shih chung*, or "right in the midst (of prosperity)." Other expressions concern wealth, happiness, honor, long life, numerous sons and posterity, and official position (*ibid.*, p. 83). It is assumed that the pasting up of these mottoes on red paper tends to cause them to come true; in other words, that there is a magical power in these expressions when they are written on red paper and pasted up above and on the two sides of the front doors at New Year time (Hodous, 1929, pp. 1-2; Bredon and Mitrophanow, 1927, pp. 82-84; Graham, 1928b, p. 38).

Before midnight on the last day of the year all debts are supposed to be paid. People who cannot or are unwilling to pay their debts hide from their creditors, who are very persistent in their attempts to col-

lect. The creditors sometimes continue their efforts to collect until after midnight, and in extreme cases after dawn the next day, when they sometimes carry lighted lanterns in the pretense that it is still dark.

On the day before New Year all shops are closed. Strips of red paper are pasted over the cash box and most of the goods to indicate that now nothing can be bought or sold. In earlier times most shops remained closed until the 15th day of the first moon, or later, but since the beginning of the Chinese Republic some shops have opened before the 15th.

Between midnight and daylight on the first day of the New Year, the kitchen god is welcomed back home. Firecrackers are set off, candles and incense are lighted, and spirit money is burned, and his image is pasted or hung up in the kitchen and worshiped. From this time until the 23d of the 12th moon, when he is ceremonially sent up to Heaven, he is always present and keeps a careful watch over the moral conduct, the industry, and the economy of the family.

On New Year's day and several days afterward, many boys roam around the streets in groups, joyfully beating drums and gongs and blowing horns. Men, women, and children go to the temples and worship the gods, kowtowing and burning candles, incense, and spirit money. They also visit their friends in their homes, leaving red-paper calling cards, drinking tea, and eating the sweetmeats that are provided by their hosts. The guests bow respectfully with folded hands, and wish their hosts a happy and prosperous New Year, and the hosts reciprocate by doing the same. Generally the guests carry away with them some of the cookies, nuts, and candy.

On New Year's day or a day or two later people visit the graves of their ancestors, set off some firecrackers, light candles and incense, and offer some food and wine to their ancestors. They put cash paper all over the mounds of the graves, each piece held in place by a clod of dirt, as an offering to their ancestors and as evidence that the family has been filial and has not neglected the ancestors. The food is eaten and most of the wine drunk near the tombs.

A very old custom is that on New Year's day the oldest parents sit beside each other in chairs in the main room, and their descendants, beginning with the oldest and most direct, come and kowtow to the old people saying *ying-tang*, which means "I ought to." This custom symbolizes the respect and obedience of the youngest generations to the oldest.

During the first five days of the new year, the tablets of the ances-

tors in the homes are worshiped twice a day, morning and evening. Incense and candles are lighted, and there are bows and prostrations. Many also worship their ancestors in the same way in the ancestral temples. After the fifth day, the ancestors are not worshiped daily in many homes, but it is customary to worship them twice a day on the 1st and 15th days of each lunar month.

In many of the well-to-do homes, on the second day of the new year or later, there is a feast called *ta-ya-chi* 打牙祭. In this feast there are meat, fruit, vegetables, and wine, and the servants are invited to share the meal with the members of the family.

Beginning on New Year's day, there is a great deal of gambling in the homes and on the streets. There are places where it is difficult to walk along the streets because of the crowds of gamblers and spectators. On the fifth day the officials put up proclamations saying that gambling must cease. After that there is less gambling, but it is not entirely discontinued.

A favorite amusement from the 5th to the 15th day of the new year is "playing lion." Two men carry over their heads and bodies a representation of a lion—head, body, and tail. The legs of the two men are the four legs of the lion. A third man carries a sword. As musicians beat drums, gongs, and cymbals, the man and the lion dance about fighting each other, and always the man is victorious. There are always crowds of interested spectators.

At dusk on the ninth day of the first moon, lamps called *pai-ko-teng* are lighted in the yards of prominent temples or in places nearby. Two strings of lights are hung vertically from tall upright poles. They are lighted every night up to and including the 15th, and are left burning for hours. It is believed that they cause peace and prosperity by keeping away demons, for demons love darkness and fear light. On the same nights lamps are lighted on the streets in worship of Heaven, earth, and other gods.

The dragon lantern parade begins on the 13th and continues through the 15th of the 1st moon. It provides amusement for thousands of people, and the streets are generally crowded with spectators. On the 13th the parade is mostly by day, on the 14th mostly by night, and on the 15th only at night. First the parade goes to the yamen, the stores, and the homes of wealthy people, and then on the streets. The dragons are made of cloth and paper fastened to strong hoops and held up on upright poles by carriers, and are generally 40 or 50 feet long. The head is large, with its mouth wide open, and with large eyes and a large tongue. The carriers walk or trot a few feet apart. At the rear

end is the tail, which resembles the tail of a fish. A man walks in front carrying on a pole a paper ball in which is a light. It is called a *pao* (precious), and represents the sun, the moon, or a star. The head of the dragon is constantly trying to swallow the ball. As the dragon proceeds, it frequently makes circles to the left, counterclockwise.

The dragon is carried by strong young men who are naked above the waist but wear conical hats. As they carry the dragon, they dance vigorously. As the dragon moves along, in addition to making occasional circles, it imitates the undulatory movements of a snake. Strings of firecrackers hanging from long poles are lighted, sometimes two at a time. Some of the firecrackers are made so that they do not explode, but sizzle through the air in a fiery circle. Drums, gongs, and cymbals are beaten, and handfuls of powder are lighted, so that they puff fire and smoke. Large bamboo tubes open at one end are filled with powder mixed with iron filings. When this is lighted, streams of fire, smoke, and sparks spurt over the dragon and over the dancers. To keep from being burned by the sparks, the carriers dance vigorously.

The dragon parade furnishes entertainment and amusement for a great many people. In addition it is believed to benefit the people and the community by exorcising the demons who might cause sickness and other calamities.

On the morning of the 15th day of the 1st lunar month, many firecrackers are set off. People worship the ancestral tablets in the homes and in the ancestral temples, lighting candles and incense, burning spirit money, and generally offering food and wine. They also worship the gods in the homes and in the temples.

On this day most of the shops open for business, although some open earlier and some later. The opening must take place at a lucky time, usually early. If a customer comes before a store has been opened, or just as it is being opened, and makes a purchase, it is considered lucky. At the time of opening, firecrackers are set off to make a good impression. Incense and candles are lighted, and the ancestors and house gods are worshiped. If an enemy comes at this time and creates a disturbance, knocking over furniture and some of the goods, it is considered very bad luck, and a serious loss of face, as well as a lawsuit, often ensues.

The *Ch'ing Ming* 清明, or Spring Festival, generally comes early in the third moon, but sometimes late in the second moon, just 106 days after the winter solstice. It often occurs early in April

(Hodous, 1929, p. 92; Bredon and Mitrophanow, 1927, p. 216; Couling, 1917, p. 176). The two words mean bright and clear. One tradition is that in its earliest stages, it was observed with fertility dances by young men and young women, but that later this was discarded (Bredon and Mitrophanow, 1927, p. 218). Hodous calls attention to the fact that in the struggle between the *yang*, bright, and the *yin*, dark, the *yang* now becomes victorious and dominant. This victory is shared not only by the living, but also by the dead (Hodous, 1929, p. 92).

On this day people of all ages walk to the graves of their ancestors. There they repair the graves, light incense and candles and burn spirit money, and offer food and wine to the spirits of the dead. Some of the wine is poured out on the ground. The living kowtow very reverently before the tombs, then they eat a cold meal and drink wine. The main objects of this festival are to commemorate, honor, and give needed offerings to the dead, but it also gives refreshment to the living through the exercise of walking and the breathing of the fresh spring air.

In I-pin, where I was a missionary pastor for nearly 20 years, the church owned a graveyard in which nearly all the members buried their dead. On the afternoon of Easter Sunday the members and their friends went to the graveyard, decorated all the graves with flowers, and then held a Christian religious service of commemoration. After this a cold meal was eaten. Some of my Chinese friends told me that this service did a great deal to bind the church members together and to the church.

On the fifth day of the fifth moon is the festival called *tuan yang*, or the Dragon Boat Festival. On this day salted eggs and good food are eaten, and a special wine called *hsiung-huang-chiu* is used. Some of the wine is drunk, and some poured out on the floor. This is believed to prevent people from having boils and some other diseases, and to keep away snakes and caterpillars. A vegetable called *ta-shuan* is mixed with the wine. Children rub tea on their faces and foreheads to keep away boils. Two kinds of grass called *ch'ung-p'u* and *ch'en-ai* are hung above the doors to keep away the demons. Dogs and foxes made of *ch'en-ai* are sometimes hung above the front doors and left there all year to help keep away demons.

In the afternoon all shops are closed, and many thousands of people go to a river or stream where dragon-boat races are held. The boats race after ducks that are released by the spectators, and after the races the crew of each boat feasts on the ducks they have caught.

This custom commemorates the death of a Chinese official who, centuries ago, drowned himself because the Emperor would not listen to reason.

On this day Buddhist and Taoist priests sell charms which are pasted up in the house to protect the inmates from demons. Other charms are to protect people from snakes, lizards, frogs, centipedes, and mosquitoes. A "snake medicine" is sold in the belief that it will cure snake bites. About dark some people take baths in which is a kind of grass believed to prevent boils. In more recent years cloth monkeys and a package of medicine called *hsiung-huang* are sewed on the clothes of children as charms to protect them from demons.

This is one of the three festivals during which people are supposed to collect and to pay their debts. It is a day when some servants are dismissed and others hired. On this day the god of pestilence is supposed to come down to earth. Many people visit their friends. People pick herbs to be used as medicine, believing that they will be especially potent in healing diseases. Many seem to regard this day as one which is surcharged with potency.

On the 15th day of the 7th moon is a festival called by some westerners All Souls' Day and in Chinese *Yü-lan-huei*. On the first day of this month the demons or hungry ghosts are supposed to be released from hell and allowed to roam over the earth. Ceremonies often begin on the 13th and reach their climax and come to an end on the night of the 15th.

On the 13th, 14th, and 15th, Buddhist and Taoist priests chant their sacred books on behalf of the hungry ghosts. In some cities on the 13th (for instance, in Ya-an) widows weep loudly for their deceased husbands, but widowers do not weep for their deceased wives. On the 15th there is a family meal at which the deceased ancestors are believed to be present. Food and wine are placed on the table, with bowls, chopsticks, and spoons at their places, and left for an hour. Then the living descendants eat the food.

On the 15th, before and after dark, great quantities of spirit money are burned. At dusk there is a procession of priests and laymen to a stream or river, where many lights are released on the water to be carried downstream in a long line. The sight is very impressive. The idea is to give the demons and orphan spirits much money through the burning of spirit money, and to entice them away downstream by means of the lights.

On the 15th day of the 8th moon is the *Chung-ch'iu*, or Autumn Festival. In the evening the moon is worshiped, for it is regarded as

a god. Incense and candles are lighted and spirit money is burned, and moon-cakes, round like the moon, are offered to the moon, after which they are eaten by members of the family. Quantities of these cakes are made and sold by the candy shops, and every family buys some to eat and some to give away. The origin of this is as follows: One night at the close of the Yuan dynasty, on the 15th of the 8th moon, every family was given a round biscuit, inside of which were written characters instructing the people to rise and kill the Yuan dynasty rulers. As a result the Yuan dynasty fell. Since then the biscuits have contained sugar instead of written characters.

On the ninth day of the ninth moon is the *Ch'ung-yang-chieh*. On this day the people who can spare the time go up on the hills and mountains where they enjoy the scenery and fresh air, drink wine made of chrysanthemum blossoms, and write poetry. It is said that some of the best Chinese poetry was written on this day. There is a legend that centuries ago a man was warned by a god to leave his home on this day, for a great calamity was coming on his home. He spent the day on a nearby mountain, and when he returned he found that during the day evil spirits had visited his home and killed all his chickens and pigs.

On the 1st day of the 10th moon is a festival called *sung-han-i*, or "give winter clothing." Paper clothing is made and burned as a means of giving it to the deceased ancestors; otherwise they would suffer from cold during the coming winter. The ancestors are worshiped, incense and candles are lighted, and spirit money is burned.

To an agricultural people like the Chinese, the coming of spring is very important. They have a festival called *ying-ch'un*, or welcoming spring, which is observed near the end of the old year and the beginning of the new. The object is to induce spring to come and to bring prosperity to the farmers.

In the following words Adam Grainger (1921, p. 49) describes this custom as he found it in Chengtu:

The solar period known as the Beginning of Spring commences about Feb. 5. On the first day preparation is made for the ceremony. Very early next morning a large paper effigy of an ox drawing a plough is exhibited on the Ox-beating Ground somewhere inside the city. The magistrate attends in person accompanied by actors representing the Star of Literature and his monkey Sen. After some mountebank performances with the monkey the Star of Literature exclaims—

"May the land and the people be peaceful:

May the wind and the rain be propitious:

May the fruits of the earth be abundant."

The magistrate thereupon arises, puts his hand to the plough, and waves the ox-goad. This is the signal for a general assault on the ox, which is torn to

pieces, and the little ox effigies with which it had been filled are scrambled for by the crowd. Those who are fortunate enough to secure them take them to well-to-do farmers who give presents of money in return for them. These little oxen are supposed to bring luck to the farm for the ensuing year.

The following is my description of this ceremony, which I witnessed in I-pin:

In 1925 this ceremony was performed in Suifu on the twenty-first and twenty-second days of the twelfth moon. In the magistrate's yamen a large paper water-buffalo, and also a paper boy called a *ngao mer*, had been previously prepared. Over one hundred small water-buffaloes made of clay had been placed inside the paper water-buffalo.

On the morning of the twenty-first, the magistrate first worshiped the two paper images in the court of his yamen to the accompaniment of horns that sound a little like Scotch bagpipes. Then the magistrate joined in the procession going out of the North Gate to a special plot of ground where a plow and a live water-buffalo were waiting. In the procession the paper images were carried in front of the magistrate. On reaching the plot of ground, the magistrate again worshiped the two paper images, which had been brought along in the procession, then plowed three furrows with the plow and the live water-buffalo. The magistrate and other dignitaries drank tea together, after which the procession returned to the yamen through the East Gate. This day's ceremony is called welcoming spring.

The next day the two paper images were again taken in the procession to the plot of ground which is called the Yin Ch'uen Ba, or the flat where spring is welcomed. The magistrate again did obeisance to the two paper images. There were about 20 officers called the *ch'un-kuan* or spring officials. After the magistrate had worshiped or kowtowed to the two paper images, the 20 spring officials fell upon the paper images with clubs and beat them to pieces. At this point the onlookers rushed up and tried to secure one of the mud images of the water-buffalo. Those who were not successful snatched pieces of the paper images. I was told that these relics were taken by the lucky ones to their homes where they were supposed to protect the inmates from evil spirits. The second day's ceremony is called *da che'uen* or beat spring. The main object of the two days' ceremony is to induce spring to come so that the crops may grow and prosper. (Graham, 1928b, p. 43.)

Chinese friends have informed me that during the entire year there is no festival in which there is a feast—with the single exception of that on the ninth day of the ninth moon—during which the ancestors, the house gods, and Heaven, or T'ien-lao-yeh, are not regarded as present and worshiped with incense, candles, and spirit money, and offerings of food and wine. The deceased ancestors are an important part of the family and are therefore expected to be present and to partake of these family meals.

Whatever values these festivals may have had, real or imaginary, they have met a real need of the Chinese people for release from the

humdrum of everyday work, giving them amusement, rest, and recreation.

FESTIVALS ON THE BIRTHDAYS OF THE GODS

These festivals constitute a very interesting phase of Chinese life. While many gods are deified men, many others are nature gods. All gods, however, are thought of as having been born and so have birthdays. The gods are many, and the birthdays of several important gods occur in nearly every month of the year.

The simplest way in which worshipers celebrate the birthdays of their gods is to go to a temple on the birthday, bow and kowtow to the deity, and burn incense, candles, and usually spirit money. Often they also offer wine and food, or money or some other commodity. The gifts are accepted and used by the priests as part of their income or that of the temples.

At the end of the Manchu dynasty, many of the temples in West China had a great deal of property for which they received rentals, and worshipers also contributed very generously. This meant that many of the temples had very ample incomes, and usually the birthdays of the principal gods were occasions for great celebrations. Later, practically all the temple property was confiscated, as well as many of the temples themselves, and the people did not contribute nearly so generously. One of the results was that elaborate celebrations of the birthdays of the gods, with great parades, feasts, and theatricals, were entirely discontinued before the "liberation" of China by the Communists in 1949. Before this happened I had the good fortune to witness a number of the celebrations of the birthdays of great gods in West China.

At I-pin, on the ninth of the first lunar month, the birthday of the god Ch'eng Huang was observed. His image was in a temple on Cheng-wu-shan, a mountain just outside the city. In the morning of his birthday there was a constant stream of men, women, and children going to the temple to worship at his shrine. Soon after 10 o'clock a great parade was formed, which slowly and with dignity wended its way through the main streets of the city and back to the temple. Many thousands of people packed the streets and the shops to witness the procession and to worship. In the parade were the images of several gods, including Ch'eng Huang himself. Many actors painted their faces and wore silk robes, each carried in a sedan chair and each impersonating some god. There were numerous banners, large umbrellas, canopies, and pavilions. Soldiers, police, priests,

and laymen marched in the procession. It was truly a thrilling sight, which was followed by a feast in the temple for the principal leaders and worshippers.

I described such a birthday festival as follows (Graham, 1935, pp. 425-427):

On August 2, 1930, at the town of Li-t'o, west of Yachow, the writer witnessed a *T'u-tsu-hui* (土祖會), or a festival on the birthday of the god of earth, or the Lord of Earth. There was a procession along the city streets, which were literally packed with sightseers and worshippers. Along the way there were many offerings of pork and beans, and much lighting of candles and incense and burning of spirit money. Many who participated in the parade had their faces painted with odd streaks of gold, and black and white paint, and wore caps on which mottoes were written. People of both sexes and of all ages marched in the parade, some of them carrying small sticks of decorated wood. It is believed that the festival causes the crops to prosper, heals diseases, and wards off calamities.

In the parade were two pavilions in which were hats, shoes, candles, and many dresses and gowns. Then came a large, red-faced god, with a fan in his hand, carried in a pavilion or large sedan chair on the shoulders of coolies. Three bombs, or short guns, were occasionally set off to announce the coming of the god, and a band played typical Chinese music. Following the god were scores of common people, each carrying a wooden placard. As the god passed by, he was loudly hailed by the spectators, some of whom carried in their arms infants whom they wished the god to bless and protect. Following those who carried the placards were musicians with gongs, timbrels, and horns. Next came Ch'uan Chu, the Lord of Szechwan, who was dressed in yellow silk embroidered garments. In the center of his forehead he had a third eye which enabled him to see good and evil, and such invisible creatures as demons. As Ch'uan Chu passed along, people bowed their heads to the ground in reverent worship. After the god came a squad of soldiers to preserve order.

In the parade were people who were strikingly dressed; some had their faces painted. They participated in the procession in performance of vows. When they were sick, or were faced with some dreadful calamity, they prayed to the god for relief, and promised that if they were helped they would participate in this way in the procession on the birthday of the god. The number of people who thus took part in the procession each year seems to the common people to prove the efficacy of the god.

A witness of this procession could see clearly that the people were emotionally thrilled and deeply impressed; that emotions of reverence, awe, and wonder were aroused; and that unconsciously the people received a vivid impression of the greatness of the gods, and were made more loyal to them, the priests, and the religion. The techniques used are admirable for making such impressions on the minds of the simple people, and are evidently the result of centuries of experience.

It is evident that financial reasons had much to do with the discontinuance, before China became Communist, of the great festivals on the birthdays of the gods. It is also evident that the weakening

of the faith of the common people in their old religions was an important contributing cause.

OATHS, VOWS, PRAYERS, SACRIFICES, AND OFFERINGS

Oaths are generally resorted to when a person is accused of a crime or when his truthfulness is in question. They are made in the name of one of the gods. For example, if a person is accused of stealing a pig, he may say, "If I stole that pig, may the god of thunder strike me dead." Few guilty people will swear such an oath, for they believe that if they did the god would actually strike them dead. In 1924 I was crossing the Ta-hsiang-lin Pass west of Ya-an and stopped at an inn to rest. The carriers with me drank some tea and proceeded to pay for it. The landlady asserted that one of the men had not paid enough and demanded some more money. After a time the head coolie said to the landlady, "Will you swear by a certain god that you are telling the truth, and if not that the god may burn down this house?" "I will not swear that oath," she replied. The carrier did not pay the money demanded, and all believed that the woman had been telling a lie.

Vows are almost inseparable from prayers, for they are promises connected with prayers. The request may be for almost any favor, or for an object, but very often it is for healing from some sort of pain or sickness. Practically every vow is paid, for it is believed that otherwise the god will get angry and punish the offender. The vow may be that if the person is healed a pilgrimage will be made to Mount Omei, or that the god will be given a new suit of clothes (a new coat of paint), or that the shrine or the temple will be repaired, or that the worshiper or his family will give the god a chicken or a pig, some spirit money, or something else.

In An-lin-ch'iao on March 28, 1930, a woman was very ill. The relatives prayed to a god to heal her and promised that if he did they would give the god a wife. The sick woman recovered, and the family gave the god a straw woman with white paper marked with ears, eyes, and nose as a face, and paper as a dress. A chicken was also presented to the god.

I have heard of many cases in which a suppliant with a sore hand or foot prayed to a god for healing and promised that if he were healed, he would present the god with a hand or a foot. After the healing, a straw hand or a straw foot was presented to the god.

Among the simplest prayers are those in which there is a request

without a promise or vow. First incense and candles are lighted, then there are bows and prostrations, and the worshiper calls the god by name and makes a request. The incense and the candles may be omitted.

I once traveled on the Min River between I-pin and Lo-shan when monsoon rains had turned the river into a muddy, roaring torrent. Boatmen were pulling the boat upstream by means of a bamboo cable, when the cable broke. Only the head boatman was on the boat to man the oars. We found ourselves in a boat that was being driven rapidly downstream by the swift water and in danger of being wrecked by the rocks below. The boatman was so frightened that he did nothing but pray, "God Wang Yeh, come and save our lives." A Chinese passenger who believed less in the gods than in the efficacy of human effort said, "Stop praying to Wang Yeh and take an oar and row us to shore, or we may all be drowned." The boatman obeyed, and we were rowed safely to shore.

One day we were in a ferryboat between Lo-shan and Ch'ien-wei. On the cliff above us was a shrine in which there was an image of Kuanyin, the goddess of mercy. In the boat a woman holding a baby looked up at the image of Kuanyin above and said, "Goddess of Mercy, protect my child."

Generally a person or a family prepares for a prayer by burning incense and candles and by reverently bowing and kowtowing. Sometimes spirit money is also burned and an offering is made. After the prayer there are generally more bows and prostrations, and vows accompanying prayers are very common.

The Chinese have elaborate ceremonies to obtain sons and to bring rain, and Westerners describe all these ceremonies as praying for sons and praying for rain. In so doing there may be some misconception of what the Chinese are doing and what is in their minds. For instance, the Chinese do little praying when they repeat or chant their sacred books, for there is little prayer in the books, sometimes none. Chanting the sacred books brings favor with the gods and makes them propitious, it being thought by many to have a compelling, magical effect. In the procession of men and boys when seeking rain, the throwing of water and letting it fall on people and on the ground is imitative magic. Pilfering a wooden baby from the shrine of a god or stealing clothing or bedding from the shrine of a sleeping Buddha constitute the seeking of sons by magic, although these acts may be accompanied by prayer.

Most Chinese prayers are not devotional services for spiritual edi-

fiction. While they are very sincere, they are almost always to obtain practical benefits—good crops, rain, happiness, sons, healing, protection, and other benefits that have to do with a satisfying life. Of course there are prayers and ceremonies to release the souls of deceased relatives from hell, or to insure a happy rebirth.

Prayers to the gods are sometimes written or printed on paper, sealed in an envelope, and burned. It is believed that burning transfers the prayer to the god, who receives and reads it. The following is my translation of such a letter burned to the kitchen god on the 23d day of the 12th moon, when the kitchen god ascends to heaven to make his report about the family to the Jade Emperor (Graham, 1935, p. 50):

I, ———, representing the whole family, reverently and sincerely come and beseech you to hear us. You have great merit in saving the world and nourishing all people. You protect us with virtue and mercy. You control and judge the good and the evil deeds of our family. In our cooking and in our eating and drinking we depend on your mercy. Through all the year you care for us. But we are uncleanly in our habits, think unclean thoughts, and trouble you. We write you this letter hoping that you will forgive our sins, and not report them to the Pearly Emperor, thus causing the whole family to be grateful to you.

(Date.)

Worship is honoring or paying respects to the gods. It includes the burning of candles and incense, the burning of spirit money, generally prayers and vows, and bows and prostrations with folded hands. When it is more elaborate, it includes music and chanting or singing the sacred books. Worship in the larger sense is very inclusive, involving pilgrimages to temples and shrines and to sacred mountains.

There have been many speculations as to the beginnings of worship and its root motives. Some have emphasized the fact that primitive man naturally feels insecure because of the dangers, often misunderstood, that he faces. Fire, flood, earthquake, lightning, diseases, enemies, and other things threaten his life and happiness. Through magic, religion, and worship he believes that he gets the help of superhuman powers and of the gods, which gives him a much needed sense of security.

A Chinese friend of little education volunteered the following explanation of the beginning of worship and its development into the worship of the gods. He believed that in ancient times men saw fire, water (often in floods), lightning, and other wonders in nature, and, thinking of these as living and having supernatural power, feared and worshiped them as superhuman beings. Later he thought

of them as manlike gods of fire, water, and thunder, and so worshiped their manlike images. He said that the sun and the moon are regarded as real, living deities. It seems to me that fear, awe, and wonder are primary elements in primitive religion, and that these same elements are fundamentals in religious worship.

Candles and incense are means of showing honor and respect. They also add to one's karma because their ceremonial lighting and burning are meritorious acts. The smell of incense is supposed to be pleasing to the ancestors and to the gods, and to put them in a good humor so that they will be propitious. Thus incense and candles are important in religious worship.

In an act of worship in the home, at a wayside shrine, or in a temple, the worshiper or the priest generally first lights incense and candles, then bows and prostrates himself before the god. The simplest way is to fold the hands with palms together, then move the folded hands up and down three times, also generally bowing the head. The more elaborate way is three bows with folded hands waved up and down, three kowtows, three more bows, three more kowtows, three more bows, three more kowtows, and three final bows, moving the hands up and down with each bow, making a total of nine kowtows.

More elaborate forms of worship are performed by one or more priests for individuals or for families, and the priests must be paid for it. The number of priests and the length and elaborateness of the ceremonies depends on the amount of money that is paid. In these ceremonies there is music and the chanting of sacred books.

The great festivals on the birthdays of the gods may be regarded as worship in the broadest sense. Hundreds and often thousands of people go to the temples and worship the gods, and as the images of the gods are carried through the streets in gigantic parades, the spectators and the people whose homes and stores are passed burn incense and candles and bow in worship. The great crowds and the parades fill the people with a sense of wonder and admiration, and they naturally bow in worship.

Near Hsüin-chien-ssu in southern Szechwan, there was a man who kept several bulls for use in grinding soya beans to make bean curd and bean cakes. I visited his place and saw the bulls, one of which was very large. The man's business prospered, and the value of the bulls went up. Finally, according to the testimony of his neighbors, he burned candles and incense to, and worshiped, the largest bull. Apparently he was moved to do so by his wonder and admiration for the animal (Graham, 1928b, p. 77).

Worship may be at any convenient time, but there are also special times of worship in the homes, at the wayside shrines, and in the temples.

In the homes there is generally worship every day, sometimes twice a day, morning and evening. Incense is burned, sometimes candles are lighted, and a male member of the family, with folded hands, bows in worship. On the 1st and 15th of each lunar month there is more elaborate worship, when food and wine may be offered. Ancestral tablets and house gods, and sometimes other gods such as Kuan Yin and the god of wealth, are worshiped in the homes. There is also more elaborate worship in the homes on the first days of the new year. In fact, there is no festival during the year, excepting the ninth day of the ninth moon, when there is not special worship of the ancestors and the house gods.

In the temples, a priest goes to every idol at daylight and at dusk, lights a few sticks of incense, and bows in worship. Often he does not utter a word. During the day any person at any time may perform his devotions. On the lunar festivals and on the birthdays of the gods the ceremonies are much more elaborate, and often several priests take part. The worship may include music and the chanting of the sacred books. The great festivals on the birthdays of the gods include a feast, a procession through the streets, and theatricals. Broadly interpreted, all these are worship, for the gods, too, are supposed to watch and enjoy the theatricals.

Sacrifices and offerings in West China differ in purpose and meaning from those among the ancient Israelites. They are not generally for the propitiation of sins. Not even among the Ch'iang are innocent lambs offered to propitiate for the sins of worshipers—in fact, lambs are not sacrificed at all among these people, but full-grown sheep or goats.

It is believed that the deceased ancestors after death need the same things as they do in this world, and that it is the duty of the descendants to provide them. This they do through offerings during ancestral worship. The gods also need sacrifices and money, and these are provided during worship.

In ancestral worship the ancestors are invited to come and share the family meal, and it is believed that they are actually present and eat. What they eat is the essence of the food, and what remains is eaten by the living descendants. Houses, sedan chairs, servants, gold and silver ingots, cash, dollars, and many other things are made of paper or of paper and strips of wood and are transformed by burn-

ing into objects that can be used by the deceased ancestors. Money is offered to the gods by burning, but food and wine are first offered to the ancestors and deities, then eaten or drunk by the living descendants.

Offerings are made to the ancestors because it is believed that they need them, and with the expectation that in return the ancestors will protect and help their descendants and grant them many favors. Some offerings are made to the gods before requests are made, with the idea that they will cause the gods to be propitious, but many offerings are made in the payment of vows, or promises, made when praying to the gods for some favor.

Up to recent decades Chinese officials did not receive any salaries. They were appointed as rulers in certain regions, and one of their duties was to collect taxes. They were held responsible for the payment of a certain amount to their superiors, and what they collected beyond that was their own. One source of an official's income was the giving of gifts by people who desired favors. No person would think of asking a favor without first making a gift. In cases of litigation, both the accused and the accuser gave presents to the magistrates. Often the gifts were money. A proverb says, "The door of the yamen is opened wide. If you are in the right but have no money, there is no use to enter."

It is customary to make gifts to important people whom you know on their birthdays, weddings, funerals, and on many other occasions. I returned to the United States on furlough four times, and the fifth time to remain. Each time, Chinese friends gave many presents, varying from eggs, pieces of sugarcane, and chickens to beautiful and valuable embroideries, paintings, porcelains, bronzes, and other objects.

In China people give presents to friends whom they love and respect, and also to important people from whom they desire and expect favors. These social customs go a long way toward explaining the sacrifices and offerings of the Chinese to their ancestors and to their gods.

SHRINES, TEMPLES, AND SACRED MOUNTAINS

Wayside shrines may be regarded as miniature temples. They are often found by the sides of roads and paths in the country, and in the streets of towns and cities. In their simplest forms they have images of gods, but no walls or roofs. Generally they are open in front so that the gods can see and be seen by the worshipers, but have walls and roofs to protect the images of the gods from the rain,

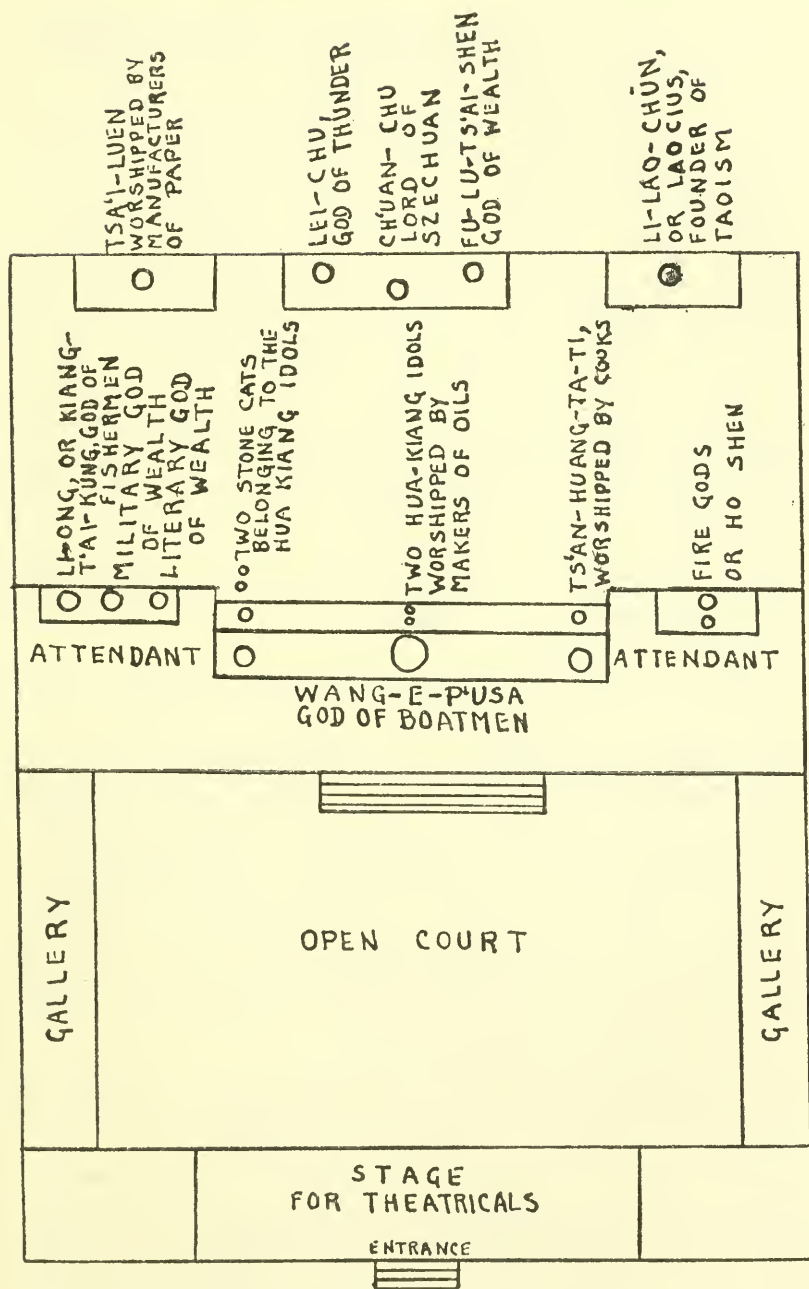


FIG. 3.—The Wang-E-Miao of Li-chuang.

wind, and sunshine. The more elaborate wayside shrines have from two to five stories, each with the image of one or two gods, the second less common image being the spouse of the male god. The gods in wayside shrines are generally Kuanyin, the *t'u-ti* and his spouse, Amitabha, Ling-kuan, and T'ai-shan-shih-kan-tang. A main duty of each of these gods is to protect people from demons.

The *tuan kungs*, priests of the Wu Chiao, the wizard society or society of black magic, have no temples but have shrines for the worship of many gods in the center against the back wall of the front room of their homes. There is a shelf about 4 feet above the floor, and above this is the usual house god, a red paper on which is written the characters meaning Heaven, Earth, Rulers, Relatives, and Teachers. On the shelf may or may not be three or more images of gods, together with one or more bowls filled with ashes used for the burning of incense and candles. Below are generally 20 or more images of gods and more bowls for the burning of incense and candles. One of the gods worshiped by the *tuan kung* is Wu Ch'ang, who is also a god of hunters. Others are Kuanyin, the god of wealth, and Ling Kuan. The front door is usually left open, so that passersby can see the shrine and the images.

There is a Confucian temple in every *fu* or prefecture, and in every *hsien* or township city. Since Suifu, or I-pin, is both a *fu* and a *hsien*, it has two Confucian temples. In the city of Chengtu are two *hsiens*, Chengtu hsien and Hwa-yang hsien; hence there are three Confucian temples in Chengtu. These temples normally have no images. I have seen only one image of Confucius or of any other in a Confucian temple, and that was at Suifu, and I heard of another in Shantung. Apparently images in Confucian temples are very rare. Instead there are many wooden tablets on which are the names of Confucius and his most important disciples. They look like enlarged spirit tablets, and incense and candles are burned to these tablets. The walls of Confucian temples are red.

In recent decades many Confucian temples have been used as schools. The Chinese think that this is an appropriate use for them, since Confucius was such an advocate of education.

Buddhist and Taoist temples are houses for the gods and the priests, and convenient places for worship. The priests must have houses where they can live, eat, sleep, and worship, and where they can store their sacred books, their ceremonial clothing, their sacred implements, and other belongings. The few images of gods, generally of T'ai-shan-shih-kan-tang and of Amitabha, that are in way-

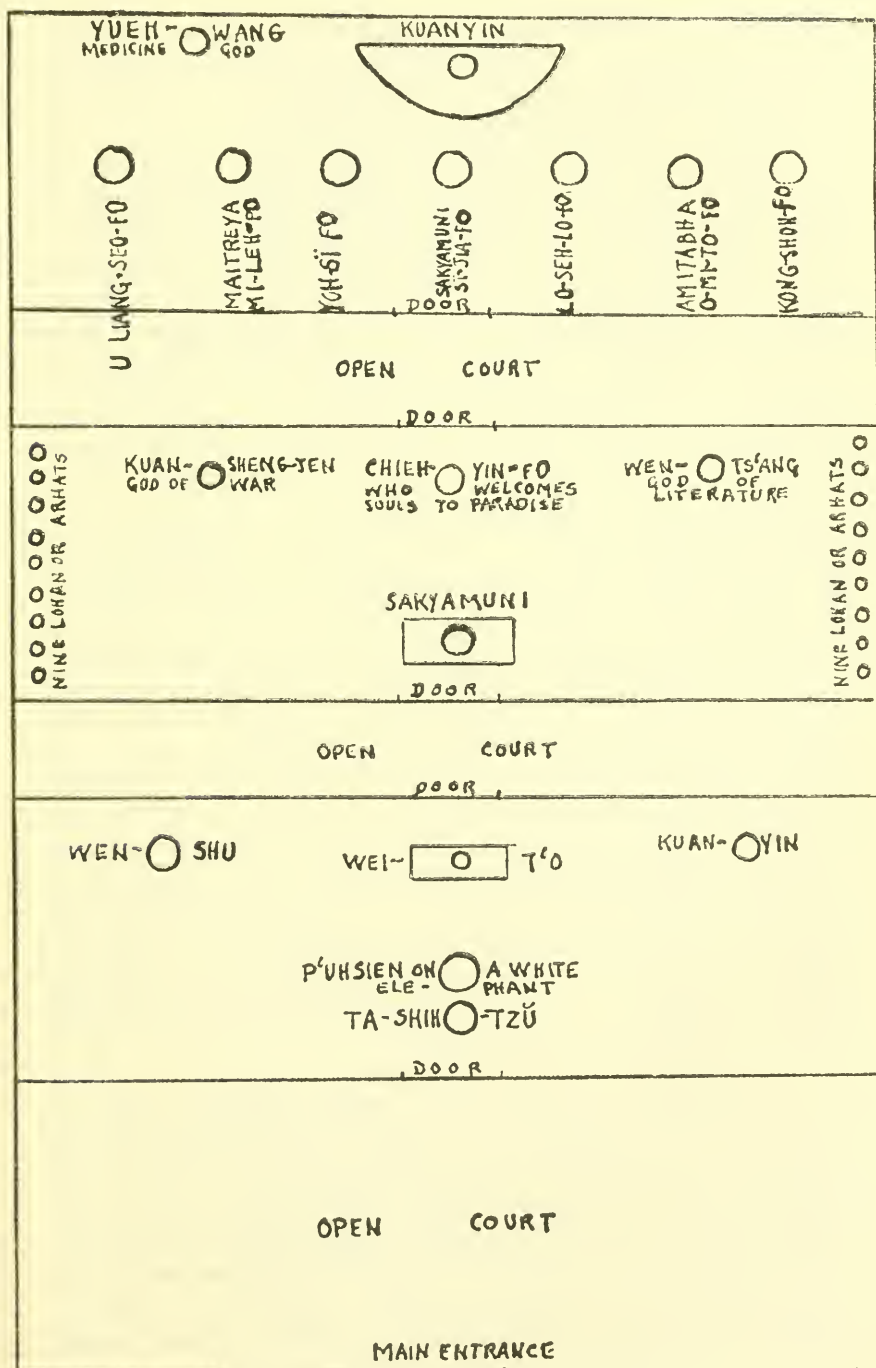


FIG. 4.—The Seven Buddhas Monastery.

side shrines without protecting roofs are carved out of hard stone. I have seen temples, the roofs of which have been ruined, thus exposing the images for a time to the elements; in a few months most of the images were damaged by the heavy rains.

Buddhist and Taoist temples are thought of as belonging to the communities in which they are situated. This is why in recent years people have considered that they had the right to use the temples for other purposes. On the other hand, each temple generally has a group of priests and lay members who control the affairs of the temple. In Lo-shan an organization was trying to purchase a temple. When a priest told me that it could not be sold, a lay leader whispered to me that it could be sold. At Tou-pa, a village near An-pien, the community became much interested in education. They used several temples for schools, and the temple incomes for the support of the schools. I have heard of other places where similar events took place.

The most common name for a temple is *miao*, but there are several other names such as *ssu*, *an* (West China *ngan*), *t'ang*, *kuan*, and *kung*. According to the Encyclopaedia Sinica a Buddhist monastery is called *ssu*, and a nunnery, *an*, while both may be called *t'ang*. A Taoist monastery or nunnery is called *kuan*, and a Taoist monastery—but not a nunnery—may be called *kung*. Ancestral halls of private families are called *t'zu*. In West China ancestral halls are also called *chung miao* or *chung t'ang* (Couling, 1917, p. 553).

The number of temples varies in each village, city, or locality. Chengtu, which normally had a population of 500,000, had 210 temples. Suifu, with a population of 100,000, had 83 temples. In and very near Li-chuang, whose population was 20,000, there were 20 temples. Chio-ch'i, with a population of nearly 10,000, had 15 temples. These numbers may be regarded as fairly typical. Noting the number and size of the temples built and supported by the Chinese people, one may wonder at the statement sometimes made that the Chinese people are not very religious.

Buddhist and Taoist temples look so much alike that one cannot see any difference between them. Temples sometimes have on the top of the roof images of gods, dragons, and other creatures, and, like most other Chinese buildings, the ends of the roof turn upward. They are generally larger and higher than the other buildings near them. The doors are wide and high, and their two halves open inward. Instead of glass windows, there are beautiful wooden lattices, some of the designs of which have come down for centuries and even millennia. Some of the smallest temples are square, but most temples

are oblong. The largest have several large halls and courts, the halls alternating with the courts. On the main door of a temple two large door gods are painted, one on each half. In front of this door there are sometimes two large stone lions, one male and one female. The male lion has one foot on a ball, and the female often has a baby lion with her. The names of the temples are written in large characters above the main entrance, so that they can be seen from a distance.

On the inside, above the main entrance of some of the largest temples, are stages and dressing rooms for theatricals. In front of the stages are open courts, and on the two sides of these are balconies. From the open courts and the balconies many people view the theatricals, and it is believed that the gods, whose images are inside the temples, also watch and enjoy them.

Every temple has at least one cookstove, sleeping places for the priests, and cupboards for the storage of dishes and cooking utensils. In the largest temples there are separate kitchens and bedrooms, and in some, separate dining rooms.

Although a few temples in Szechwan are believed to date from the T'ang dynasty more than a thousand years ago, most of them were built during the Manchu dynasty. Very few were built during the era of the Chinese Republic, and most of these are small.

Every temple, in view of the fact that it is a home for gods and priests and a place for worship, is a holy place. This sacredness often extends to the trees that grow in the yards or courtyards of the temples, some of which are holy and cannot be cut down.

A temple may be located at any place for the sake of convenience, but a goodly number of them have been erected in places noted for the beauty of the scenery and which naturally arouse the emotions of admiration, awe, and wonder. Many illustrations could be given. A few *li* down the Min River from Chengtu is a temple called Wang-chiang-lo, or "look-at-river pavilion," because of a beautiful pavilion in the temple grounds from which there is a fine view up and down the river. Shih-pao-chai, on the Yangtse River between Chungking and Ichang, is a temple built on the top of a great rock, flat on top and surrounded on every side by perpendicular cliffs, and reached only by stairs going up through the beautiful pavilion of several stories. From the top there is a grand view of the Yangtse River and the surrounding tree-covered hills and mountains. Several temples at Suifu are on the tops of nearby mountains whence there is a fine view of forest-covered mountains and the Min and the Yangtse Rivers. Huang-lung-ssu, or Yellow Dragon Gorge, has several tem-

ples. It is a place of marvelous beauty, in a canyon the sides of which are covered by green forests. There are many beautiful flowers, including wild red poppies. Up the canyon is a snow-covered peak, Hsueh-pao-ting-shan, and down the canyon is a ridge with unbelievably beautiful foldings of the rock strata. A crystal-clear stream flows down the canyon, on the bottom and sides of which are bright-yellow stones. In the stream are dozens of pools like those of the Yellowstone Park. This is a holy of holies for a very wide region, and many thousands of pilgrims of many ethnic groups come every year to worship.

It is also true that mountains from which there are unusually fine views are likely to be sacred and to have shrines and temples built on them. Mount Omei is thought by some to be the most beautiful mountain in the world. It has a great precipice 6,000 feet high and hundreds of beautiful scenes, with cliffs, natural caves, mountain streams, forests, and views of the Min and the Ya Valleys and of the snow-covered peaks of eastern Tibet. Near the summit is an inscription that expresses the feelings of the pilgrims, "One foot from heaven." Wa Shan, apparently the highest mountain in central Szechwan, is striking and grand in appearance, its top flat and forest covered. On every side is a perpendicular cliff, the highest rising 4,000 feet, and the top can be reached only by going over a steep and perilous path. One who approaches and climbs this mountain, as I have, will be almost overwhelmed by feelings of fear, wonder, and awe. Little wonder that it is a sacred mountain. Minya Konka, on the China-Tibetan border, is the highest mountain in Sikang. It is over 24,000 feet high and from a distance looks like a great pure-white pyramid. To the Tibetans it is not only sacred, but it is a god, and at its base are temples where pilgrims come to worship.

It is well known that there are four sacred mountains in China where the emperors in former times went to worship heaven and earth. On these there are now many temples where thousands of pilgrims go to worship every year. It is not so well known that there are many other sacred mountains in China, especially in West China. The most sacred mountain of West China is Mount Omei. On its sides and on its summit are many Buddhist temples, and to this mountain come pilgrims from all over China, from Mongolia, and from Tibet.

Ch'ing-ch'eng-shan is the Taoist rival of Mount Omei in Szechwan. It is a high mountain peak across the Min River from Kuanhsien, and on its sides and summit are many shrines and tem-



1. A wayside shrine containing the image of Amitabha. He protects travelers who pass along this road.



2. An image of Amitabha near Hsiung-chien-ssu, south of Suifu, Szechwan province. It was made with four heads and placed at a crossroads so that the god could see in all four directions and protect people on all the roads.



3. The white pagoda at I-pin, Szechwan. These pagodas often contain images of gods that are worshiped and are believed to improve the *fengshui* of a locality so as to cause financial prosperity and the success of its residents in becoming scholars and officials.



1. The great stone Buddha across the Min River from Lo-shan. It was carved out of a solid rock cliff and is over 200 feet high.



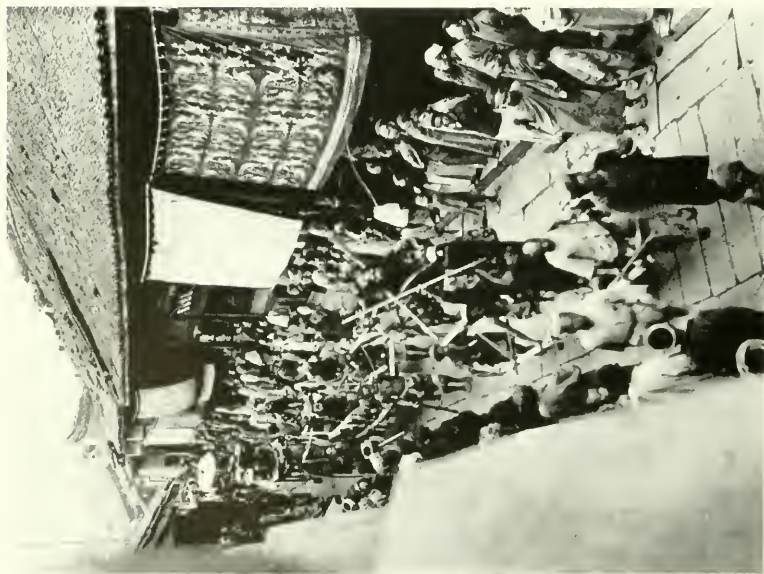
2. The head of the great stone Buddha across the Min River from Lo-shan



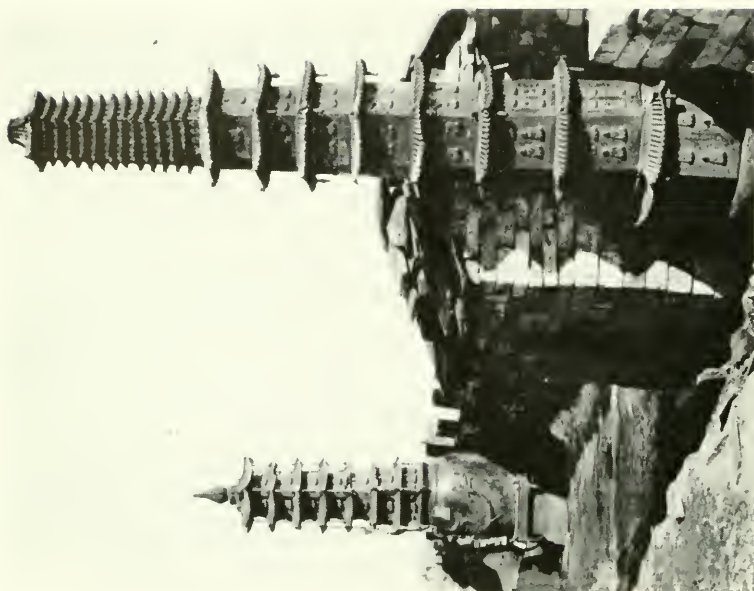
1. Left, the chicken-footed god who takes the souls of deceased people to hell for judgment and punishment.



2. The Taoist god Ling-kuan, or efficacious ruler. He wields a club with which he drives away demons.



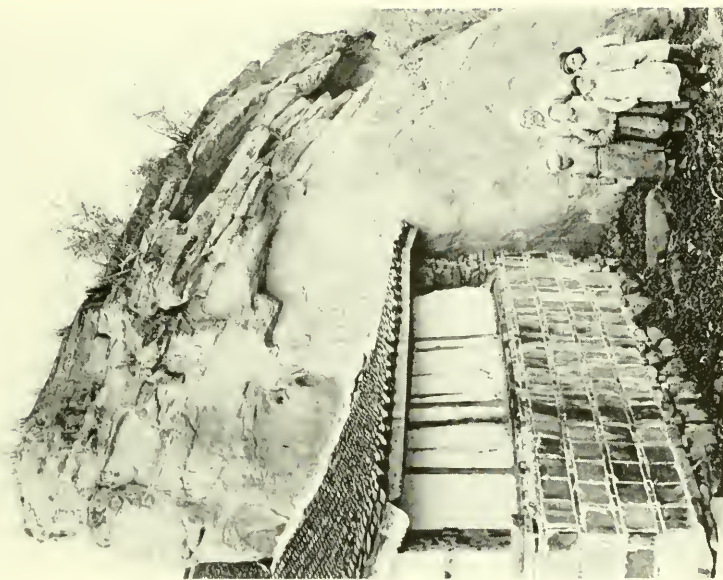
1. Actors and spectators at I-pin participating in or watching a great parade on the birthday of Cheng-huang.



2. Bronze pagodas behind the temple on the golden summit of Mount Omei. They are said to be centuries old.



1. A Buddhist priest at I-pin dressed in his finest embroidered ceremonial robes.



2. A large white stone west of I-pin which is worshiped as a god.



1. A design on the large yellow cloths that mothers used at and near Yunnanfu to wrap around the babies which they carried on their backs. These designs are regarded as potent charms to protect the babies from demons.



2. A temple at Yo-po, up the Min River from I-pin, deserted and going to ruin.

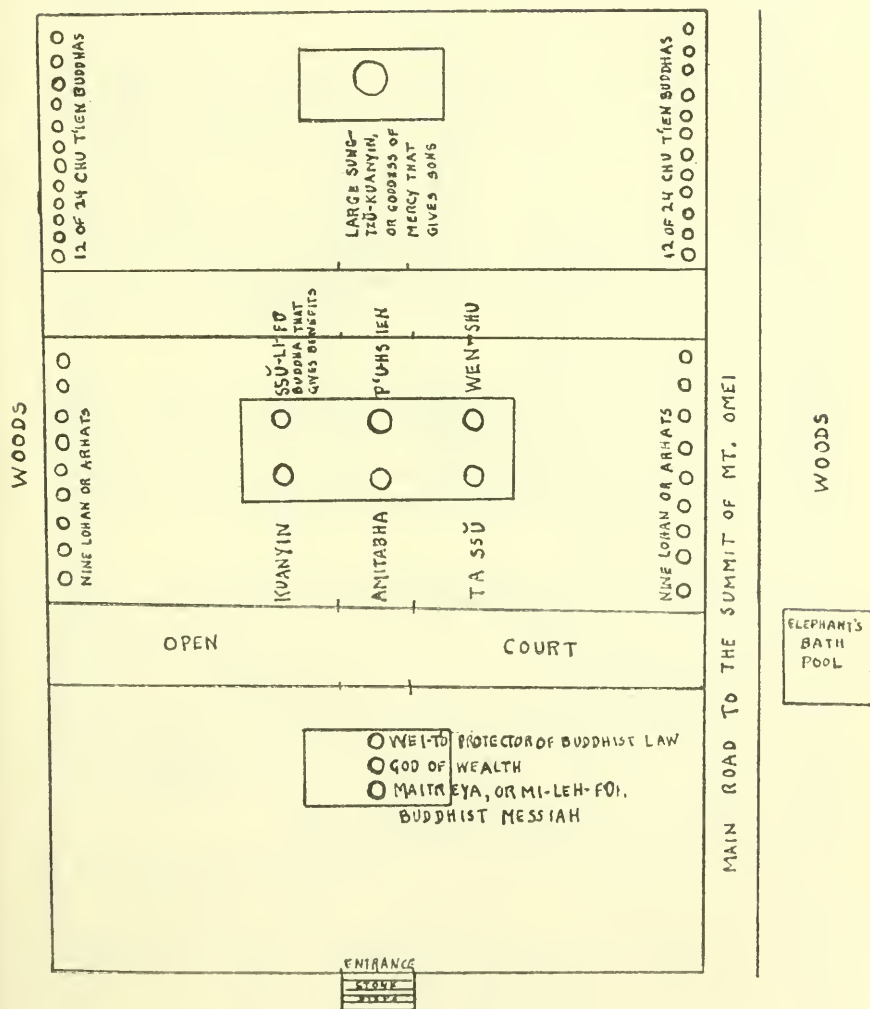


FIG. 7.—The Elephant's Bath Temple, Mt. Omei.

ples. On the opposite side of the Min River from Ch'ing-ch'eng-shan, a 2- or 3-hours' journey from Kuanhsien, is another Buddhist sacred mountain on which are several temples. We have already mentioned Minya Konka and Wa Shan, and there are other sacred mountains in eastern Tibet or Sikang.

Near Ya-an is a sacred mountain on which there are several Buddhist temples. It resembles Mount Omei in that each has a natural cave called the Chiu-lao-tung and a precipice called the Shae-shen-ai, or precipice where pilgrims sometimes leap off to sacrifice themselves.

Wa Shan is directly south from Mount Omei and is plainly visible from the Golden Summit of that mountain. It is eclipsed by Mount Omei, but every year there are pilgrims to Wa Shan from the surrounding region. Formerly there were three temples on the summit, but now there are only two.

Near the Great Omei are two other sacred mountains, Second Omei and Third Omei. There are temples on their summits, to which pilgrims go to worship throughout the year. West of I-pin is a sacred mountain called Hsiao-omei-shan, or Little Mount Omei. On it are Buddhist temples to which every year come many worshipers from the Suifu district.

South of I-pin on the Yunnan border is Chien-feng-shan, or Sharp Windy Mountain, so named because it is higher than the surrounding mountains and hence likely to be windy. It was formerly controlled by the Taoists, now by the Buddhists. People from the surrounding regions make pilgrimages to this mountain and worship in its temples.

East of I-pin, near An-lin-ch'iao, is Fu-lai-shan, or Buddha Come Mountain, so-called because of the tradition that a Buddha in one of the temples flew there. Many pilgrims come to worship on this tree-covered mountain, the highest in the region.

North of Chengtu is Bai-lu-ting, or White Deer Peak, which is a high sacred mountain. On its top are temples and forests. It is practically surrounded by perpendicular cliffs, and from its summit are marvelous views. Missionaries have bungalows on the summit of this mountain and spend their summer vacations there. It is a holy mountain to which pilgrims come to worship.

This list is far from complete. Mountains that are strikingly beautiful, and there are many such in West China, are likely to become sacred, with temples and shrines to which pilgrims come to worship their gods, seeking happiness, prosperity, and the help of the gods.

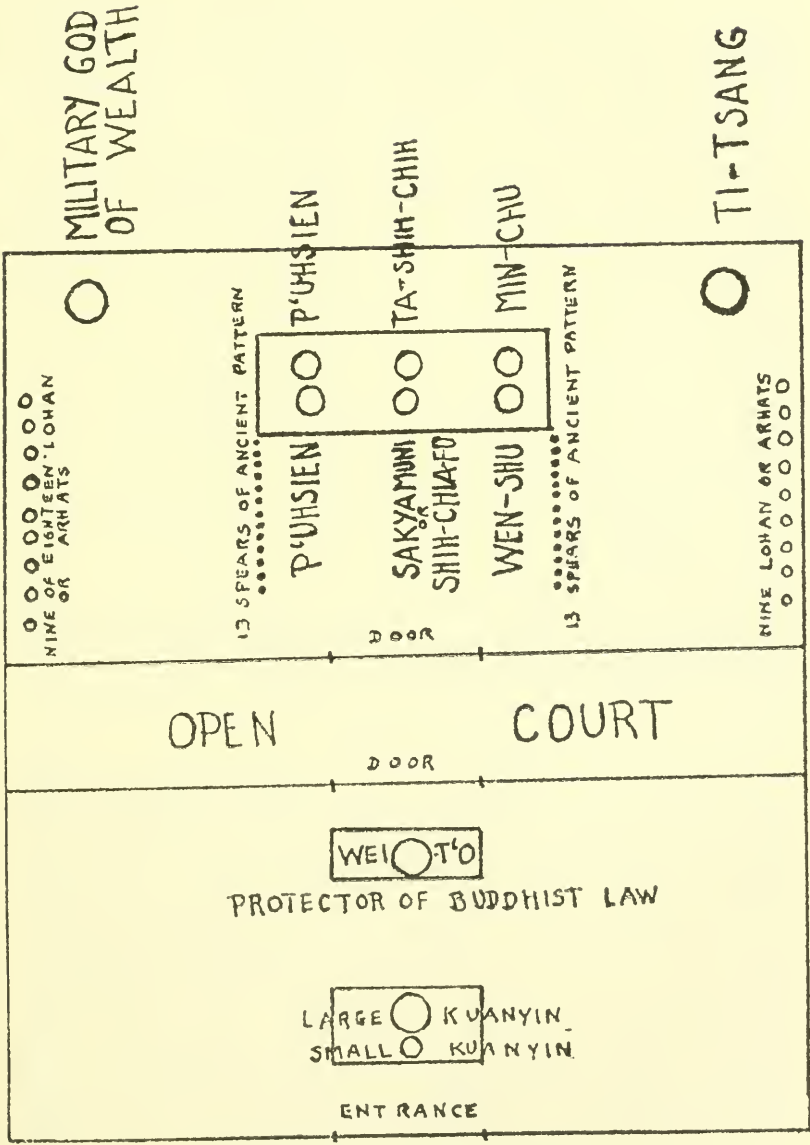


FIG. 8.—The Lien-hua-ssu Monastery.

THE GODS

Polytheism, the worship of many gods, is common among all the peoples of West China. Among the Chinese, the Tibetans, and many other ethnic groups there is also the worship of images. These beliefs and practices seem as natural to the people of this region as monotheism does to Jews, Christians, and Mohammedans.

At Suifu a Buddhist priest came to the Christian hospital to be healed of a disease. He and I became very good friends and discussed religious matters together. In one of these discussions I explained that Christians worshiped one god only. The priest replied, "One god is not enough for the Chinese, for there are too many people in China." He did not believe that one god could adequately care for 450 million people.

Among both the Chinese and the non-Chinese of West China there is the belief that when you have the picture or the image of a god, the deity whose image you have is actually present. It is also true that unless there is a picture or an image of a god in a home, a shrine, or a temple, the deity is generally regarded as not present and is not worshiped in that place.

One day while walking by the Min River near I-pin I drew on a sandbank with a walking stick a picture of Kuanyin. A country boy came by and looked at the picture. To test him I said, "This is the goddess Kuanyin. You ought to worship her." He looked at the image a moment, and seeing that it was an image of Kuanyin, he folded his hands and bowed in worship.

In Shanghai in 1911, and many times later in Szechwan and Sikang, I had an interesting experience. When I tried to take a picture of natives with whom I was not acquainted, they would run away as fast as they could as though their lives were in danger. The explanation given me by natives and by missionaries was that it is believed by many orientals that by taking one's picture you capture his soul, or at least a vital part of it, and that it enables you to shorten his life by several years, to injure him in other ways, or even to cause his death. Many times when I was taking a picture the bystanders have said, "He is going to take you to a foreign country." They meant not just the person's picture, but a vital part of the person himself. This goes a long way toward explaining image worship in China. It is assumed and believed that if one has the picture or the image of a person or a deity, the soul, mind, or personality of the one who is pictured or imaged is present. Generally the people regard it as a great advantage to see the image of the god whom they are worship-

ing. This assures them that the deity is actually present and is paying attention to the worshiper, his acts, and his prayers.

One day I had a long discussion with some boatmen about gods. Finally one boatman said, "You Christians worship a god all right, but it has no body. We make images of the gods so that we can see them and know what the gods are like." The common people feel that there must be something visible and tangible so that the mind is reached through the senses, in order that they may realize the likeness and actual presence of the god. The image is thought of as his body.

It is also assumed that sometimes the god may be asleep, or that the soul may temporarily leave the image and go elsewhere. There is therefore in front of each image a bell or a gong which is beaten by the priest to make him wake up and pay attention and to inform him that he is being worshiped. The bells or gongs generally have beautiful tones, and to the priests and the worshipers the beating and the resulting harmonious tones are an essential part of the worship.

A few gods are worshiped when there is no image present. In the temples there are images of the sun god and the moon god, but in their homes the people often worship the sun and the moon as gods without the use of any images. T'ien-lao-yeh, the aged one in heaven, is often worshiped, but I have never seen or heard of an image of this god. Sometimes in a shrine or in a temple the image of a god is removed but the people go on worshiping as though the god were still present.

Some of the tribespeople of West China, including the Ch'uan Miao and the Ch'iang, have gods of their own but make no images of them. This sometimes leads to the mistaken belief that they have no gods or that they are monotheists. A Christian Lolo once convinced me that most of the Lolos are monotheists. At the time I believed it and expressed the belief in two short articles, but now I know that I was very badly mistaken. The Ch'iang people convinced Rev. Thomas Torrance that they were monotheists, and Mr. Torrance made this affirmation in every one of his articles and in his book about the Ch'iang. Ch'iang friends, however, informed me that they purposely deceived Mr. Torrance and gave me long lists of their gods—5 major gods, 12 lesser gods, some tree gods, numerous stones worshiped as gods, and a large number of local deities. Tens of these gods are mentioned by name in the sacred books (chants) of the Ch'iang priests.

Sometimes the only visible evidence of the presence of the god in

the shrine is the name of the god written in Chinese characters. A good illustration of this is the common household god, the essential part of which consists of written characters meaning "The Throne of Heaven, Earth, Rulers, Relatives (ancestors), and Scholars." This is really the enlarged family of benefactors. Heaven protects us and gives us light and rain, the earth gives us food, the rulers give us laws and protection, the ancestors assist and protect us, and the scholars give precious instruction to our children. The word *chün* meaning rulers also includes the emperor, and after the founding of the republic some families in West China substituted for the word *chün* the word *kuo* meaning country, which is more in harmony with the new nationalism. I have also seen kitchen gods that consisted of a red scroll with the names of the kitchen god and his spouse down the center. On the right is a phrase meaning "the ruler (or lord) who gives orders among men," and on the left is a phrase meaning "the god who is ears and eyes of heaven above."

Occasionally one will see in a shrine, instead of an image, the name of the god or the goddess written on paper or wood or carved on wood or stone. In such a shrine the god is worshiped and regarded as present. Sometimes one will see in a shrine a large, smooth river stone on which the picture of the god has been drawn or painted, and which is being worshiped. The picture of the god T'ai-shan-shih-kan-tang is sometimes painted on the convex side of a large wooden dipper, which is hung up above the front door to keep out demons.

In West China an observer is impressed by the large number of images of the gods. They are frequently seen in the homes, in wayside shrines, and in the temples. Some are carved on stone cliffs beside well-traveled roads or above rivers.

The people of West China regard the images of the gods as real deities, although a few regard them as mere statues. In the summer of 1925 a Ta-yung-fa-ssu, one of the greatest Buddhists of all China, visited Mount Omei and granted me an interview. He stated that there were very few Chinese in West China who regarded the images as mere statues, but that the number of such people was larger in East China and in Japan. I have never met a Buddhist or a Taoist priest who did not regard the images of gods as real, living deities. The spirit of skepticism and unbelief has increased greatly in West China in recent years, so that there is an increasing number who do not believe what practically everybody of all ages and walks of life believed in 1900 and even later—namely, that the images of the gods are actual, living deities.

Images of the gods may be drawn, written, or printed on paper. Before the New Year people all over West China sell colored images of door gods and kitchen gods that have been printed on paper. During the day before the New Year the door gods are pasted up on the front doors, and between midnight and daylight on the first day of the year the kitchen god is pasted or hung up in the kitchen. They are worshiped as real, living deities. Other such gods printed in color on paper and sold before each New Year are the *t'u-ti* and his spouse and three gods printed on the same paper, the gods of heaven, earth, and water.

Occasionally I have seen other gods printed on paper, including Chang Tao-ling, Ling-kuan, Kuanyin, and the god of wealth. On Mount Omei the writer saw two food advertisements and one of a noted biscuit company that had been framed and were being worshiped as gods in temples because they had on them pictures of Buddha and his worshippers. These were apparently discarded before 1945; probably they were criticized and their meanings disclosed by Chinese who could read English.

When priests are invited to Chinese homes to conduct funerals, memorial ceremonies, or ceremonies to exorcise demons, they generally bring with them a paper scroll on which is a pantheon of gods. The priests hang the scroll up in the home or nearby and worship it, burning incense or candles and making prostrations.

Most images in China are made of clay; a small number are carved out of wood or stone, and a very few are made of iron, bronze, or brass. In Sikang many small Tibetan idols are made of brass or bronze and covered with gold leaf.

The innermost core of a clay idol is a stick of wood to give the image rigidity. Straw is wrapped around this stick, then clay is added and allowed to dry. The best idols are beautifully shaped and, in some places, then covered with gold leaf. Clay images made by specialists are real works of art.

Living creatures with flesh and blood have organs and intestines, and therefore idols have square holes through their backs into their chests, in which are enclosed strings of thread, short pieces of straw, beans, tea leaves, bits of isinglass, gravel, and other small objects representing the heart, intestines, and other organs. The beans represent hearts and brains, and the bits of straw represent intestines.

Priests generally perform certain ceremonies before which the images are merely statues and after which they are living gods. Often as part of the ceremony a bloody feather is pasted to the head of the

image and offerings of food and wine are made to it. Also sometimes as part of the ceremony is the painting of the pupils of the eyes. A story in the Chinese history of the three kingdoms is that of a painter who painted a picture of a dragon so well that it looked alive. Later he painted in the pupils of the eyes, and the dragon flew away.

Images in the homes and in the temples vary in height from a few inches to over 100 feet. The great stone Buddha across the Min River from Lo-shan is over 200 feet high and is by far the largest and tallest in West China.

Some of the images of the gods in the temples have three eyes, one on each side of the nose and one in the middle of the forehead. Much more rarely there are four eyes. Some of the largest images of Kuanyin, with a thousand arms and hands, have an eye in the palm of each hand. It is believed that these unusual eyes enable the gods to see the good and evil in men's hearts and also the demons, all of which are generally invisible.

Some of the gods whose images are worshiped are noted national heroes, such as Kuan-ti, Yo-fei, and Chu-ko Liang, commemoration being actually a motive for deification. Of course there is the idea that they have supernatural power and that if worshiped they will use this superhuman potency for the benefit of the worshipers.

Many of the gods who are deified men are patron deities of the occupations pursued by these men when living. Because they were very successful in these occupations, they are supposed to have superhuman wisdom and power which become available to those who worship them. A few examples are Tu-k'ang, the god of brewers and those who sell liquor; Shen-nung, the god of agriculture; Lu-pan, the god of carpenters; Chang-yeh, the god of butchers; Chang-huang the god of cooks; Wen-ch'ang, Confucius, and Ts'ang-chih, gods of scholars; and Hua-t'o, the god of surgeons.

The deification of men has gone on until very recent years. During the occupation of Szechwan by Yunnan troops, following the attempt of Yuan Shih-kai to become emperor of China, a Yunnan officer governed so well in a certain locality that the people deified him and worshiped him. I heard of a man near Ya-an who, because he contributed money to the temples so liberally, was deified and worshiped while he was still living. In a small shrine outside the main entrance of the Ta-o-ssu monastery on Mount Omei was the image of an old man who was still living in 1927. He was very devoted to Buddhism and made large contributions to the Ta-o-ssu temple. He was therefore deified and his image placed in this shrine and wor-

shipped. About 15 years later when I again visited this temple, the priests said that this man had died and his image was still being worshiped. Near I-pin, at the foot of the mountain near the black pagoda, is a temple called T'si-hang-kuan. In this temple is the image of one Lo Hsin-hsuen, who in 1930 still lived near I-pin. Because he had donated the money with which the temple was built, people deified him and worshiped him as a god while he was still alive. Most of the gods whose images are in the temples are deified men.

Most of the people of West China regard inanimate things as alive. The sun, the earth, the moon, the stars, mountains, rivers, trees, and rocks are thought of as living, animate beings. It is little wonder, therefore, that rocks and trees are sometimes worshiped as gods.

West of Mu-p'ing in Sikang Province is the village of Yao-chi. Among the people of this region many white stones are actually worshiped as gods and are called in Chinese, pusahs or Boddhisatvas. On one mountain I saw a number of gray stones that had been stood on end and were worshiped as gods. Between Ch'ien-wei and Lo-shan laborers working on a road came upon a large rock that they could not easily remove. A priest suggested that it might be a king of rocks, so the laborers burned incense to it and worshiped it as a god. Inside the city of Chengtu a large sandstone rock in a special temple built for it is worshiped as a deity. It is reported that the rock fell from the sky, but in composition it is exactly the same as much of the sandstone near Chengtu. Rev. Orlando Jolliffe reported to me that while he lived in Tseliutsing there was a stone in the yard of his compound that was worshiped as a god by the local people. West of I-pin near the Yangtse River is a large piece of white sandstone that is worshiped as a god. When people began to worship it, a small temple was built around it and other idols were added. It is believed that if a person takes a few grains of this sandstone, mixes them with water, and drinks the water, it will cure diseases.

A peculiar kind of stone worship in the Suifu prefecture is the worship of foundation stones used under the bases of wooden pillars in large buildings and temples. Some such stones are called T'an-shen-teng-teng and are worshiped as lesser deities, lower than the *t'u-ti*. Sometimes they are seen in private homes, sometimes by the sides of roads, and sometimes in temples. It is believed that if this god is worshiped frequently, sincerely, and elaborately, he will help the family in many ways, but if the family neglects him or has to be too economical in his worship, he becomes spiteful and injures the family.

Among the Ch'iang the white stone is sacred but generally is not worshiped as a god, although I found a number of white stones and some not white that are worshiped by these people as living gods. White stones so worshiped are found at O-erh, at Ho-p'ing-chai, and at Hsiao-chai-tzu. At Chia-shan-chai there is a white stone called the White Stone King in a shrine in a temple that is worshiped as a local god. In the sacred grove at Lung-ch'i-chai is a slender black stone 22 inches high that is worshiped as a local deity. In the temple is a white stone that is worshiped as a mountain god. In the upper village of K'a-ku in a shrine is a white stone worshiped by some as a grain god and by others as Ts'ang-chih, the Chinese god of scholars. Near Lo-bu-chai and Hsiao-chai-tzu a rock as large as a large house is worshiped as a god who heals diseases. On a mountain near Li-fan is a temple called Pai(white)-kung-ssu in which are three large white stones worshiped as gods.

There are many sacred trees in West China, some of which are worshiped as gods. I have been told that tree gods are fairly common among the Ch'uan Miao. Among the Ch'iang there is one 15 *li* from T'ao-tzu-p'ing, another, a great pine tree, behind the temple at Ru-ta-chai, which is near Chia-shan-chai, and at least one at Ho-p'ing-chai. Near Fu-yen-ch'i, west of An-pien, is a great banyan tree, believed to be centuries old, which is worshiped as a god. Above a shrine at the foot of the tree are four characters meaning "(he) greatly manifests majesty and efficacy." On the right are five characters meaning "worship me, Mr. Huang," and on the left are five characters meaning "(I will) protect you from calamities."

At the Sen-lin-ssu, or Deep Forest Monastery, above An-pien are three trees that are worshiped as gods. One is a banyan tree, one an orange tree, and one is called in Chinese a *mung-tzu-shou*. There is a tradition that an official named Hsiao tied his horse to one of these trees, but the horse refused to eat. The official said, "These trees are gods," and worshiped them. After that the horse ate, which was regarded as evidence that the trees were gods. Since then the trees have been constantly worshiped, and the temple was erected near the trees.

On Chen-wu-shan, a mountain near I-pin, there were formerly two great old cypress trees that were tree gods. It is said that they were planted during the Ming dynasty. One died and fell on a nearby temple where it remained two or three years. People did not wish to cut it up because it was a god. Then part of it was carved into three gods which were placed in a Suifu temple, and the rest of

it was cut into small pieces and sold as medicine. One tree still standing in 1948 was still worshiped.

Outside the west gate of Lo-shan is a great banyan tree that is a tree god and is called Huang-ko-chiang-chün, or General Banyan. Another tree god is a great pine tree in the Ta-o-ssu, or Great Goose Monastery, on Mount Omei. Another, a banyan tree at P'ai-fang-shan, east of Pigsty Rapid, above Ch'ian-wei, is called Huang-ko-tahsien, or Great Immortal Banyan, and is famed for its ability to heal sore feet. In the village of Huang-lung-ch'i, near Chiang-k'ou, is a very large banyan tree that is worshiped as a god and is called Huang-ko-cheng-jen, or Banyan Immortal. In the City God Temple of Chengtu, just inside the Great East Gate, is a very large ginkgo tree that is worshiped as a divinity. Near a temple at Kuan-hsien I saw a hardwood tree called *Nan mu* 5 feet in diameter and nearby a large cypress tree, parts of which resembled human eyes, nose, mouth, and feet. Both were worshiped as divinities. No doubt there are many other such trees in West China which I have not seen.

That trees should be worshiped as gods in West China is not at all strange, for they are regarded as living, sentient creatures. Any tree of great age, like a human being that becomes an immortal and never dies, may become a god. At Kan-pai-shou, a village on the Min River above I-pin, is an old dead cypress tree that is still worshiped as a deity even after it is dead.

In the region between Lo-shan and Chengtu turnips sometimes grow to a very large size. It is asserted that they sometimes weigh between 25 and 50 pounds. Such a large turnip is regarded as a god and is called a *lo-pu-wang*, or turnip king. When such a turnip grows on a man's farm it is the duty of the farmer to build a platform and to have ceremonies of worship performed, besides giving a feast. Such ceremonies of worship are believed to cause turnips to grow better in that locality. They are so expensive that many farmers dig the turnips up and eat or sell them before they get too large, so that they will not have to perform the ceremonies of worship.

Many Chinese gods are commonly worshiped by both Buddhists and Taoists and so belong exclusively to neither religion. There has also been much mutual borrowing. Kuanyin, originally a Buddhist deity, is as popular and common among the Taoists as among the Buddhists (Bredon and Mitrophanow, 1927, p. 52).

The following is a partial list of the Buddhist gods. Some Buddhists regard them all as not different gods, but merely different mani-

festations of the "Buddha nature." Most people in West China regard them as different deities.

Dipanhara Buddha, Buddha of fixed light, sometimes the Jan-teng-fo, the god with lights who heals.

Maitreya, Mi-lo-fo, the coming Buddha.

Manla, Yao-shih-fo, the healing Buddha, god of medicine.

Manjusri, Wen-shu, or Wen-shu-shi-li.

Samantabhadra, P'uhsien.

Avalokitesvara, Kuanyin, goddess of mercy.

Marici, Chun-t'i, goddess of the dawn.

Veda, Wei-t'o, protector of Buddhist temples and Buddhist law.

Bodhidharma, Ta-mo-chu-shih, a leader in Zen Buddhism, deified.

Amitabha, O-mi-t'o-fo, god of infinite light and compassion.

Kshitigarbha, Ti-tsang-p'u-sa, overlord of hell.

Sakyamuni Buddha, Shih-chia-mu-ni, the founder of Buddhism.

The 10 rulers of hell.

The 18 Arhats or Lo-hans, and the 500 Arhats or Lo-hans.

The triad called in Chinese Kuei-e-fo, Kuei-e-fa, and Kuei-e-shen.

The following are more distinctly Taoist gods and are generally found in Taoist temples: Hsi-wang-mu, P'an-ku, Lao-tzu, Yüan-shih-t'ien-chen, the original immortal, Yü-huang-shang-ti, the Jade Emperor, Hsüan-t'ien-shang-ti, the ruler of the skies, the eight immortals, Chang Tao-ling, the first Taoist pope, Tou-mu, the dipper mother, Heng-ha-er-chiang, the two blowing and snorting generals, and the triad T'ai-ch'in, Yü-ch'in, and Shang-ch'in.

A few of the gods would not be rated high in moral character, as for instance the chicken-footed god and Wu-er-yeh, who take the souls of the deceased to Hades to be judged. They and their spouses often have opium smeared on their lips, for it is believed that they love opium. When a person has boils on his legs he may imagine that Wu-er-yeh has spanked his soul; he thereupon puts some opium on the lips of the god, after which he expects to get well. Then there is a god of thieves who helps thieves and robbers steal successfully. It is my impression, however, that on the whole the Chinese gods are much higher morally than the gods of Tibet and India, some of which are very lustful and cruel.

Chinese gods have a superhuman wisdom and power which they make available to their worshipers. I have seen shrines and temples which were allowed to go to ruin because the people thought that their gods had lost their superhuman power.

KARMA AND TRANSMIGRATION

The doctrines of karma and transmigration are entirely lacking in the ancient Confucian and Taoist writings. They did not originate

in China, but in India, whence they were brought to China and propagated there by the Buddhists. There is no trace of these doctrines in the Vedas of ancient India, but they appear later in the Bramanas and are fully developed in the Upanishads. They are accepted by most of the religions of India, including Buddhism. Today they are accepted without question by most of the Chinese people.

The doctrine of karma teaches that every act has its retribution. Good deeds have good consequences and evil deeds bring evil. There is a proverb known throughout China, *shan yu shan pao, o yu o pao, ju yu pu pao, jih tzu wei tao*. This means, "Good has a good recompense, evil has an evil recompense. If there has been no recompense, the time has not arrived." This theory is often very hard to reconcile with facts and events if a person has only one life. But in India as well as in China karma is supplemented by the doctrine of transmigration, according to which the same person is reborn many times without end, until he achieves nirvana or Buddhahood or becomes an immortal. This makes it possible to explain apparently undeserved sufferings or sorrow, or blessings and good fortune, as the deserved rewards of conduct in previous existences. The Buddhists claim as evidence that an enlightened Arhat can remember his past existences and foresee the future destinies of himself and others.

Closely allied to these doctrines is that of fate. It is true that this doctrine existed in China before the coming of Buddhism, and it is also true that it has been influenced by the Buddhist doctrines of karma and transmigration, so that in the popular mind they are inseparable. One's merit or demerit accumulates so that he is destined to enjoy happiness or to suffer calamities. This applies even to the animal world. For instance, if a hunter shoots at a duck and kills it, the remark is likely to be made, "*t'a kai ssu*," whereas if the hunter misses and the duck escapes, he is told, "*t'a pu kai ssu*," meaning that because of deeds in past existences the duck was destined to die or to escape with his life. The Buddhist doctrines of karma and transmigration have altered and enriched the Chinese idea of fate, so that it now has much more of a moral value and sense of justice than it originally had.

The Chinese name for karma is *yin kuo*, and for transmigration *lun hui*. *Yin* means "cause," and *kuo* means "fruits or results," and thus the expression means "the effects of causes." I have a Buddhist book in Chinese called *yin kuo* which explains this doctrine and its relation to transmigration. A person's merit or demerit because of his

conduct may cause him to be reborn after death as a king, a scholar, a merchant, a woman, a beggar, or as a snake, a bird, an animal, or an insect, and any of these may be the present incarnation of one's ancestor. Therefore, according to strict Buddhism, and this theory in general, one should not kill any living thing.

There are many kinds of good deeds that will accumulate merit, improve one's karma, and insure a better fate in this life and in the lives to come. A very common kind is the giving of money to beggars or to begging priests, who often urge one to do good deeds in order to accumulate merit. Other common methods are to contribute money, meat, rice, or some other commodity to the priests or to the temples, or to help pay for the erection of a pagoda, a shrine, or a temple, for the construction of an idol, for giving the idol a new coat of paint, or to pay the priests to chant the sacred books.

Merit can be accumulated by doing something good, and demerit by doing something evil. Building or repairing bridges, constructing or repairing roads, giving food to famine sufferers and to others who are hungry, helping people in distress, and healing diseases—these and many other good deeds add to one's merit. Missionary doctors have often been told that they have great merit because of the many people they have healed.

While returning from an expedition beyond Mu-p'ing, on which I was collecting natural history specimens for the Smithsonian Institution, I was stopped by a swollen mountain stream which had washed out a bridge. With the aid of a carpenter, I cut down some nearby trees, made a new bridge, and was soon on my way. Chinese informed me that by building this bridge I had added to my merit.

The doctrines of karma and transmigration provide strong motives for doing good and not evil, and no doubt have helped keep the conduct of the Chinese people on a comparatively high level. These, however, are of course not the highest motives for good conduct, for they are selfish.

Today karma and transmigration are not exclusive doctrines of the Buddhists, for they are believed and taught by both Buddhists and Taoists and are also basic assumptions in the popular religion of the Chinese and of many other ethnic groups in China. In the main they strongly influence for good the everyday living of the people. That this is so is a credit to the efficient teaching of Buddhist leaders for many generations.

HEAVEN AND HELL

The universe is divided into the land of living beings and the land of the deceased spirits, and these have different names. Everything is *yang* or *yin*, and these are no exceptions. The world of living beings is *yang chieh*, and that of the spirits of the dead is *yin chieh*. The *yang chieh* is lighter and more desirable than the *yin chieh*, which is dark and shadowy.

The Ch'uan Miao regard the land of the departed spirits as a place where conditions are much the same as those under which the ancestors of the Ch'uan Miao lived during prehistoric times. There are forests, and the souls of the dead live partly on wild berries and wild fruit. The Chinese conception of *yin chieh* has come down from past millennia, but during recent centuries has been modified by the Buddhist doctrines of karma, transmigration, hell, and heaven. Offerings to deceased ancestors must be kept up for at least three generations. It is not too clear what happens to the souls of the ancestors after that, but one idea is that they dissolve or cease to be.

The Buddhists have contributed to the religions of China the conception of a hell with 10 courts, each court presided over by a god called a king, and each court subdivided into as many as 16 dungeons or pits where sinners are punished according to the nature of their crimes. Each god who presides over a court has as assistants lesser gods, lictors, and devils. Some of these have human bodies and heads of horses or cows. The largest number appear to be devils, who administer punishment.

The 10th court is that of reincarnation. Those whose good deeds and merit outweigh the bad go directly from the 1st court to the 10th for a happy reincarnation, but the others must first endure punishment in one or more of the other courts. All before reincarnation have to cross a bridge where two demons try to seize them and throw them into the water.

Among the many punishments are the following, often seen in Buddhist hells portrayed by lifelike images in 10 hells: Being immersed in an icy pool of water, chewed by dogs, tied to a hollow metal pillar inside which there is a fire, skinned alive, hung up by the feet and tortured, having the head, the arms, and the legs cut off, falling onto sword mountain where several swords pierce one's body, having the scalp cut off the front part of the head, being pierced by a trident, having the eyes gouged out, the body cut in two near the waist, the heart torn out, the intestines pulled out, the body sawn in two lengthwise, being pounded on the head, boiled in a

cauldron of oil, having mouth or feet burned by fire, the abdomen cut open, nails driven into the head, being bitten by snakes, ground up between two large grinding-stones, and numerous others.

The idea of hell as portrayed in the Buddhist temples is not disputed by the Taoists. In fact, I have seen at least one Taoist temple, the Tung-yo-miao outside the west gate of Li-chuang, which has a hell very closely resembling those of the Buddhists. The hell of the Buddhists is so fully accepted and believed in by the Chinese people that it is an important part of the popular religion of China.

One day during World War II I was in a bus going from Chengtu to Lo-shan. As usual at that time, the roof of the bus was covered with baggage and with passengers sitting on the baggage. Inside, the seats were crowded, and quite a few people crawled through the windows and literally sat on the passengers inside. A big fat woman crawled through a window and sat on two passengers nearby. For the men she was sitting on, her weight was painful. I decided to try a little psychology on this woman. Speaking out loud in Chinese I said, "Won't some people suffer in hell. Nien Wang (king of hell) will look in his book and note those who have crowded in and sat on others. Some will be thrown onto sword mountain, some will be sawn in two, and some will be thrown into the boiling cauldron of oil." The fat woman said to the other passengers, "I'm going to get out at the next station," and she did. Hell with its dreadful punishments was very real to her.

The Buddhists have a western heaven presided over by Amitabha (some Buddhists and some Taoists believe in many heavens and many hells). There many become Buddhas and are free from sin, sorrow, and suffering. They may also escape transmigration. This appeals to some very devout Buddhists, but not to the Chinese people in general. They want to enjoy the present life or to accumulate merit so as to enjoy a happy and fortunate existence after rebirth. The Chinese are an optimistic, life-loving people, and in spite of sorrow, hardships, and suffering, they prefer life in this world.

PRIMARY CONCERN WITH PRACTICAL BENEFITS

In 1935 I published an article on the religion of the Chinese in Szechwan in the Chinese Recorder, which began with the statement that the popular religion of the Chinese in Szechwan is exceedingly practical. Many times in this present publication it has been emphasized that the Chinese people expect practical results in their everyday lives from the practices of their religion. Prof. Wing-tsit Chan

says, "In all its various forms, the religion of the masses aims at earthly blessings. We may dismiss this as primitive. However, we cannot be blind to the glaring fact that the Chinese masses keep their eyes on the ground so far as religion is concerned." (Chan, 1953, p. 173.) It is true that the Chinese people now believe in karma and transmigration, and in heavens and hells, but it is also true that the folk religion of the Chinese, in almost all its phases, is primarily concerned with this life and with the satisfying of human needs in this world.

In 1930 the writer was reading with the help of a Chinese teacher the Taoist sacred book, "The Sacred Book of the Original Vows of the Kitchen God." The teacher remarked, "You ought to take notice of an important fact. Almost every phase of the religion of our common people is supposed to be of some practical benefit to them." He emphasized the fact that virtually every ceremony, every prayer, and every god is supposed to be of some practical value in the everyday lives of the people.

In "The Sacred Book of the Original Vows of the Kitchen God" it is asserted that the religion that it represents helps people to avoid illness and cures them of diseases so that sicknesses depart; helps the aged; protects homes from demons; insures rain at the proper times; protects people from danger and saves them from calamities; tames wild animals so that they will do no harm; causes worthy sons to be born; gives an easy childbirth and saves the new-born baby and the mother from illness; and helps people escape the punishments of hell.

Every occupation, great or small, important or unimportant, has at least one patron deity, and some have several. Conversely, most of the gods are patron deities or at least are supposed to benefit the worshipers in practical ways. In the survey of the temples of Suifu, published in the Chinese Recorder in February 1930, I noted many gods that were patron deities of one or more occupations. During the survey of the temples of Chengtu, which was done later, a student made a list of 100 gods and the people or occupations they were supposed to benefit. There is a god for those who raise pigs, and another for those who sell them. There is a god for those who make fire-crackers, and another for those who sell them. There is a god for those who carry water from the rivers and creeks to sell, and another for the men, women, and children who gather twigs, grass, and leaves on the hillsides to burn in their stoves. There is even a god of thieves, who helps them to steal successfully.

The following is a very incomplete list of gods and the occupations for which they are patron deities:

Deity

Wen-ts'ai-shen, literary god of wealth.
 Wu-ts'ai-shen, military god of wealth.
 Wang-yeh.

Kuan-ti, or Kuan-yü.

Yo-wang, god of medicine.
 Wen-ch'ang, god of learning.
 Fu-hsi.
 Chan-huang.
 Ku'ei-hsing.
 Chang-fei.
 Huai-nan.
 Ts'ai-hou or Ts'ai-weng.

Ch'iu-tsu.
 Ma-wang, horse king.
 T'ai-tzu-p'u-sa, heir apparent.
 Chang-ku-lao.

Wu-ch'ang.
 Hai-li-shen-mu.

Chu-t'ien-p'u-sa.
 Shan-wang, mountain god.
 Ta-shih-chih-p'u-sa.
 Hung-chün-p'u-sa.
 Meng-t'ien.
 Ch'i-hsien-niang-niang.
 Shen-tsu.
 Hsiao-ho.
 Ts'ao-ts'an.
 Kao-hua-tzu-p'u-sa.
 Ch'ang-sheng-fo.
 Wu-weng.
 Fan-wang.
 Ho-shen, fire god.
 Li-lao-chün or Lao-tzu.

Hsüan-yuen-huang-ti.
 Tu-k'ang.
 Tou-mu-niang-niang, goddess of the northern dipper.
 Ku-wang, grain god.
 Ko-weng.
 Lu-pan.
 Shen-nung.
 Ta-mo-tsu-shi, Bodhidharma.

Occupation

Bankers, merchants, and all who wish to prosper financially.
 The same.
 Boatmen and woodcutters in the mountain forests.
 Soldiers, officials, members of secret societies.
 Doctors and those who sell medicines.
 Students, teachers, scholars, Geomancers and fortunetellers.
 Cooks, caterers at feasts.
 Students, teachers, scholars.
 Butchers.
 Makers of bean curd.
 Dyers and people who make or sell paper.
 Makers of firecrackers.
 People who raise, keep, or sell horses.
 Actors.
 Those who make music on tomtoms covered with snake skin.
Tuan kungs (geomancers) and hunters.
 Those who make cloth straps or strings for use on straw sandals.
 Thieves and robbers.
 Hunters.
 Students, teachers, and scholars.
 Makers of wooden combs.
 Makers of Chinese pens.
 Weavers of cloth.
 Workers in leather.
 Lawyers and magistrates.
 Lawyers.
 Beggars.
 Cloth makers and yamen runners.
 Fishermen.
 Those who sell bowls and dishes.
 Those who sell firecrackers.
 Workers in gold, silver, copper, brass, pewter, and iron.
 Tailors.
 Brewers and owners of liquor stores.
 Fortunetellers.
 Rice growers.
 Dyers.
 Carpenters, plasterers, stonemasons, makers of tiles and bricks.
 Farmers and restaurant owners.
 Boxers and prize fighters.

The writer has spent parts of several summers at Hsin-k'ai-ssu on Mount Omei and has talked with many of the pilgrims. When asked what they were seeking and what benefits they expected, they said that making the pilgrimage, worshiping the gods, and making offerings would cause the gods to be propitious and to help them in their undertakings, enabling them to prosper, to have sons, to live long, to avoid diseases and enjoy health, and to obtain happiness. They expected very practical benefits.

In the first three volumes of "Chinese Superstitions," Dore shows pictures in color of a large number of charms and tells of their uses. A partial list includes: To hasten delivery, to expel demons, to protect from fire, to ward off epidemics, to cure cough, to stop vomiting, to relieve excessive throbbing of the heart, to expel typhoid fever, to cure stomach ache, to cure dropsy, to cure heart trouble, headaches, and dyspepsia, to heal sore eyes, to cure asthma, to stop persistent perspiration, to cure fever, to dispel sadness and anxiety, to prevent delirium, to cure diarrhea, to reduce swelling of the limbs of the body, to stop bleeding of the nose, to heal breast sores of suckling women, to cure all kinds of diseases, to preserve from the effects of sunstroke, to protect one at sea, to cure diseases of cattle and pigs, to give a bountiful harvest, to end drought, to protect a new building, to increase one's fortune, to obtain a long and happy life, and to propitiate the 10 kings of hell. Charms have primarily to do with human needs in this world.

Fengshui trees and rocks must not be touched in such a way as to injure them, because if let alone and respected they will, through the *fengshui*, affect for good the lives of the families and the communities concerned. They cause financial prosperity, good crops, the avoidance of diseases and death, the advancement of scholars and officials, and help in many other ways. If they are injured, the *fengshui* is ruined, and the opposite results ensue. Ceremonies to obtain sons are of practical value, for sons are a financial asset and prolong the family line, guaranteeing the continuation of the worship of the ancestors. Ancestor worship is of practical value to the deceased ancestors, providing food, wine, clothing, money, and other needed articles, and in return the ancestors help their living descendants to prosper on earth. The exorcising of demons is a practical necessity, for demons cause sickness, death, and other calamities, and they must be exorcised and controlled so that individuals, families, and communities can prosper. Ceremonies to cause and to stop rain are of great practical value, in order to obtain abundant crops.

Divination helps people make engagements to marry, perform funeral and marriage ceremonies, begin journeys, start the work of erecting buildings, and to do other necessary tasks at the right time and in the way most likely to succeed. Bad luck can often be avoided by divination. Charms and incantations enable people to accomplish many necessary things and to avoid calamities. The dragon lantern parade from the 13th to the 15th of the 1st moon exorcises demons that might do harm and so helps families and communities to prosper.

The Ch'ing Ming festival commemorates and honors the deceased ancestors through worship, the repair of the graves, and offerings of food and wine. The living descendants are benefited through exercise and sunshine, and through the assistance of the ancestors which this ceremony helps to obtain. The Tuan Yang festival furnishes amusement and recreation, exorcises demons, helps people avoid diseases and other calamities, and through charms helps people avoid the five poisonous creatures. The ceremony of welcoming the spring induces spring to come so that men can do their farming. Festivals on the birthdays of the gods are generally regarded as freeing the community of evil spirits and bringing better health and prosperity. In Li-t'ò the people believed that the *t'u-ti* festival caused crops to prosper, healed diseases, and warded off calamities. The basic reasoning is that honoring, worshiping, and making offerings to the gods causes them to be good humored and propitious, so that they will protect, bless, and help the people in practical ways. The folk religion of West China is vitally concerned with the practical, everyday needs of the people in this world.

For centuries Buddhism and Taoism, in order to win the allegiance of the masses of the Chinese people, have stooped to their level. They have encouraged the belief that through charms, incantations, the worship of the gods, pilgrimages to sacred mountains, contributions to priests and to build or to maintain temples, and through magical religious ceremonies, practical benefits could be obtained, leading to a more successful and satisfying life in this world. During recent decades many Chinese have learned that this is not true, and their faith in their religion has been greatly weakened. This does much to explain the facts that the numbers of worshipers in the temples and of pilgrims to the sacred mountains, and the number and size of the contributions to priests and to temples, have been reduced to a fraction of what they were before, and that many temples have been torn down or confiscated and their images destroyed.

CHANGES IN RELIGION IN WEST CHINA

CAUSES

Before discussing the changes in the religion of West China, we will consider briefly the causes of these changes. They are very many, and the entire picture is very complex, but the major cause is contact with Western civilization.

Following the discovery of America by Columbus in 1492, there were other great discoveries, such as the route through the Strait of Magellan to Asia and Africa, and around Cape Horn back to Europe. This made possible commerce between the nations of Europe and those of Africa and Asia, including China. Trade developed first by sailing vessels and later by steamships and great ocean liners. Such trade increased year by year and became tremendous. There were also disastrous wars with foreign countries, including England, France, and Japan. The Boxer Indemnity was used by England and the United States to send Chinese students to those countries to obtain higher education in the great universities, and these returned to China as apostles of modern ideas. Roman Catholic missions began in the Yuan dynasty, and Protestant missions began in 1807. In time there were thousands of missionaries scattered all over China. Thousands of Protestant and Catholic schools were opened in China, which enrolled hundreds of thousands of students and gave them a modern education.

Essen M. Gale, in "Salt for the Dragon" (1953 p. 16), notes that the use of the Boxer Indemnity to send students to the United States was a great cause of educational, social, and political transformation. He also says (p. 20) that the missionaries in China, through secular teaching, brought about the revolution in China, political in only one of its aspects. He says that many modern movements are traceable to the missionaries. He mentions changes in the punishment of criminals and in coinage (p. 84), in business methods (p. 120), in cleanliness, in the addition of railroads (p. 182), in social customs (p. 194), and in transportation (p. 195). George Babcock Cressy, in "China's Geographic Foundations" (1934, pp. vii, 7-8), points out that the social, economic, and political changes in China are without parallel, and that one of the greatest changes is that the ocean is no longer a barrier but a doorway to world contacts.

E. A. Ross, in "The Changing Chinese," points out that contacts and wars with European nations did not greatly shake the confidence of the Chinese people. The Europeans, like other "barbarians" with

whom the Chinese people had come into contact, were superior in war, but to the Chinese mind inferior in culture. With Japan it was different. She owed her culture to China and in the past had been no match for China, but in the war with Japan the Chinese were easily defeated. It became evident to the Chinese that the superiority of the Japanese was due to their adoption of phases of Western culture including education. There followed the reforms of the Emperor, the coup of the Empress Dowager, the Boxer Uprising, and finally, in 1905, the decree doing away with the old educational system of China and the adoption of a new system founded on Western education. The Chinese had become convinced that only by this means could they save themselves from servitude.

Dr. Joseph Beech, in the report of the Chancellor of the West China Union University, 1932, said (p. 2) that formerly the gateway of China was in the west, but lately the seacoast cities have been the gateways to world trade and communication. Change at first was more rapid on the coast and slower in West China, but in recent years changes in West China have become marked and startling.

In January 1928 I wrote in my notebook:

Many houses and stores are modeled after foreign buildings, the main feature being the lack of the upturned ends of roofs. Many restaurants serve foreign food in foreign dishes, and knives and forks instead of chopsticks. During recent years cabbage and other foreign vegetables have appeared on farms and in the markets. Cabbage is no longer called "foreign white vegetable," but has a local name meaning "vegetable with a big head."

Some of the foreign influences have been brought home by Chinese travelers or students from foreign countries. Others were first in eastern cities. Still others were taught to Chinese by foreign missionaries and other foreigners. Carpentry, housebuilding, the making of furniture, cooking, tailoring, and many other occupations have all changed. Some ideas are spread by pictures and descriptions in magazines and papers.

On January 23, 1928, I also made the following note:

There are so many external changes in Szechwan it almost makes your head swim. Men formerly dressed in long gowns with rimless hats, but now wear foreign hats, shoes, overcoats, stockings, and even entire suits of clothes. Foreign leather shoes are now made and sold in large numbers in Szechwan. There are electric lights, telephones, and the telegraph. The foreign New Year is also observed, officials taking a three-day vacation. The jinricksha is used in many cities. Only old women wear the old-fashioned trousers. As to the middle-aged and young women and girls, their clothing is much foreignized, for good or ill. Women and girls wear skirts instead of trousers. Footbinding is disappearing rapidly. Houses and furniture are being modernized and foreignized. Stores have glass cases, and everywhere there are foreign chairs and tables made locally, and such foreign things as soap, towels, dishes, washpans, and cooking vessels.

An important influence in the changing China during the first half of the 20th century was her public schools. In 1905 the government of China decreed that the old educational system should be abolished, and in its stead a new system established based on Western education. The number of these modern schools, from the kindergarten to the university, increased steadily and sometimes rapidly until 1949, when the iron curtain went down. Natural science and many other modern subjects were taught, and through the pupils and their teachers Western culture reached the Chinese of all ages. In these schools many of the former beliefs and theories were neglected and gradually forgotten.

One night I was in company with several Chinese men and women who were university graduates. The discussion turned to the question whether men and women are equal. The writer pretended to support the idea that women are inferior because they are *yin* and men are *yang*. Then a woman who was a university graduate replied, "I do not understand the *yin-yang* theory at all, but I believe that men and women are equal." Like this woman, many of the educated Chinese were simply neglecting and forgetting many of the old beliefs.

Another cause of change in modern China was the influence of representatives of foreign governments and of foreign businessmen and their families. There were foreign ambassadors in Peking, and foreign consuls, vice consuls, and other representatives in other cities of China. While one of their main purposes was to foster trade with their mother countries, many of them were very influential. Among other things, these men introduced into China new political ideas and new ideas about the family. Mrs. Archibald Little, the wife of a British representative, waged a nationwide campaign against bound feet and for a time was known as the apostle of natural feet.

Foreign men were very prominent in the Salt Gabelle, in the Maritime Customs, and in the Chinese Post Office. They introduced modern business methods and made these organizations more efficient. Many of the captains and other officers on Chinese steamships were foreigners.

A goodly number of businessmen brought their families and lived many years in the treaty ports, and some of them traveled widely in China. They established modern factories, taught more efficient business methods, sold many foreign objects, and exerted considerable influence on the family life of the Chinese.

Another important cause of change in modern China was com-

munism. Beginning in 1919 and 1920, it spread from East China to West China, infiltrating the cities and villages and the schools of all grades. Groups of young people would go about teaching, preaching, and spreading the theories of communism, and influencing people of all ages, but especially the youth. They challenged practically everything that was old and asserted that communism had something better. One saying was, "Society is all bad. We will destroy it and build a new society." Capitalism was the exploitation of the common people, and religion was the opium of the people. All religion was superstition and would disappear in the new scientific age.

Not the least among the causes of change in every phase of life was Christianity. Its missionaries, churches, schools, and hospitals were to be found in almost every important city. From these it reached out into the villages and country through missionaries, schools, and native evangelists, preaching, teaching, and spreading Christian literature. It opposed some phases of ancestor worship, footbinding, polytheism, image worship, the belief in *yin-yang* and *fengshui*, the use of charms and incantations, and many other practices, and promoted modern education for both boys and girls, hospitals and medical schools, monotheism, and many new beliefs and practices. While the aim was constructive, it is possible that greater success was achieved in the destruction of the old than in the building up of the new.

In his book, "Religious Trends in Modern China," Prof. Wing-tsit Chan (1953, pp. 217-230) emphasizes the importance of Chinese intellectuals to the religion of modern China. They have practically set the pattern and determined the direction of the development of education, government, and religion. In recent decades they have shown an increasing interest in religion and have profoundly influenced the trend of religious events in China. An antireligious movement began in the early days of the Republic, was intensified in 1917, and reached its climax in 1922. This was followed by a strong anti-Christian movement, the most active years being from 1922 to 1927 (*ibid.*, pp. 230-232). After 1927 the attitude of the intellectuals became more affirmative, sympathetic, and constructive. This was only one phase of what took place as a result of the renaissance among Chinese intellectuals, but through students and scholars it had a tremendous effect on the Chinese people. Because of the strong anti-Christian movement, many missionaries evacuated West China in 1926 and 1927. An important byproduct of this movement and of these events was a growing skepticism and disbelief in the gods and the religions of the Chinese.

In the "Introduction to the Economic History of China," Kirby (1954, pp. 38-39) states that scientific archeology in the 1930's brought about a great change in the interpretation of early Chinese history. Instead of the legendary reigns of divine or semidivine rulers, a dependable chronology was established that profoundly influenced Chinese thought. It resulted in a widespread upsetting of old-established values. A few of these archeologists were Westerners, but most of the work was done by Chinese, such as Dr. Li-chi of the Academia Sinica, who were well trained for their work in great foreign universities, or by other Chinese whom they had trained. This, and to a considerable extent the whole renaissance movement, was a byproduct of contacts with Western civilization.

One of the ways in which new ideas and practices reached West China from East China was through newspapers, journals, and books. While there are great differences in the dialects of China, the written and printed language is everywhere the same and can be understood by all who are able to read. The lunar almanac is almost a bulwark of conservatism, but in the issue of 1928, which as usual was the same for all China, there were suggestions for wedding ceremonies that included several innovations adapted from foreign customs. Many of the best foreign books were translated into Chinese, published in East China, and circulated by schools, libraries, and book-stores throughout the entire nation. Scientific and other journals and many newspapers were published, and some of these had a wide circulation.

During the last war between China and Japan and during World War II, there occurred what may have been the greatest migration in human history. It is estimated that more than 40 million people left their homes in East China and migrated westward. Many of these millions found their way to West China, where they lived for several years. Many Chinese universities and business organizations moved west for the duration of the war. Among the migrants were people of all classes—farmers, laborers, students, teachers, scholars, scientists, businessmen, politicians, Christian leaders, wives, and children. This hastened the cultural diffusion, and increased the tendencies that we have been describing. It also created a housing problem that was accentuated by the Japanese bombing of Chinese cities and resulted in the using of many temples as hotels, houses, and apartments.

While there were conservative people, especially uneducated laborers, farmers, and old men and women, who were disappointed and

shocked at what was happening, others were very radical. There were those who adopted the opinion that all that was old was practically useless and should be exchanged for something new. Conservative people were regarded by them as old fogies. A Chinese newspaper in 1934 expressed such an opinion about Chinese temples and monuments, praising buildings of foreign style. This was answered by an article in the *China Journal* (Sowerby, 1934, pp. 1-3), which asserted that China has a glorious past and that in many phases it has excelled foreign culture.

The innovations and changes due to contacts with Western culture were not all material; even more important were ideas. In time religion was bound to be seriously affected, and many began to notice new tendencies and changes. For instance, in March 1928 in the town of T'ung-chiang in eastern Szechwan, the students went to the Board of Aldermen and asked permission to destroy the idols. The reply was that they could, but to wait a while. The students were in a hurry and paraded the streets shouting, "Destroy the power of the gods." A few idols were carried away on the backs of their worshipers and saved, but the rest were destroyed. This occurred on the birthday of Sen Yat Sen, on the third day of the third moon.

It was about this time that the leaders of Li-tuan-ch'ang, a village southeast of Suifu, decided that idols were false and useless. They turned temples into schools, shops, hotels, and the like, and destroyed all the idols but three. At first they intended to destroy all of them, but because some of the most ignorant people believed in these gods and refrained from crime for fear of the punishment of the gods, they decided to leave three of the gods in one temple as a moral restraint on the believers.

Religious changes became more and more evident. Not all of these were for the good of the Chinese people. Many beautiful memorial arches were torn down and their stone used for other purposes. First, most of the property of the temples was confiscated, then some of the temples were confiscated and sold, and others were occupied entirely or in part by soldiers, officials, schools, hospitals, police departments, and other organizations. Contributions to temples and worshipers gradually decreased. Door gods decreased in number until they entirely disappeared. Pilgrims to famous temples and to sacred mountains decreased until there were fewer than one-tenth as many as there had been before. The great festivals on the birthdays of the gods that included gigantic parades and feasts and theatricals were entirely discontinued because of lack of funds. Occasionally one

would hear a Chinese say, "Many of the Chinese do not believe in the gods any more."

To me it seemed that the religious changes taking place in China were very important and ought to be studied and interpreted. It also seemed that one of the best ways to make this study, if not the best, was to study the temples of West China. I therefore made a year's study of the temples of Suifu in 1929, and two more of the temples of Suifu at later periods. During World War II I first, with the help of three university students, made a 3-years' study of the temples of Chengtu. After this I studied for shorter periods the temples at Ya-an, Hung-ya, Chia-chiang, Lo-shan, Ch'ien-wei, and a few smaller places. The entire account would fill a large book, but I will record only what I regard as most important.

EFFECTS

A SURVEY AND STUDY OF THE TEMPLES OF CHENG TU

GENERAL INFORMATION

When I returned to Szechwan very early in 1940, the religious changes and their effects on the temples of Szechwan were so evident and so important that I decided to make a careful study of the temples of Chengtu and of as many other towns and cities in West China as possible. I planned not to make this a mere collection of statistics, however important that might be, but to supplement such studies with inquiries that would throw light on religion in general as it existed in West China.

The temples of the Chinese are vitally important in the lives of the people, forming one of the main centers of social life. Times of religious worship, whether on a small or a large scale, are also times for meeting and talking with friends and neighbors and for drinking tea and talking with priests and nuns. Every large city had a number of temples named after localities outside of Szechwan. These were constructed and used by people who came from the localities for which the temples were named. In these temples the people owning them held social gatherings, feasts, and theatricals, and often conducted business transactions, and there, of course, they also worshiped. Important religious festivals included feasts and were followed by theatricals for the enjoyment of the worshipers and also of the gods.

The temples are also the homes of the priests or nuns. There they work, worship, and sleep, and there the older priests and nuns train the initiates. There they worship the gods, chant the sacred books, drink tea, and chat with their friends and with each other.

The temples are also the homes of the gods. They must have shelter from the rain and the glaring sun, and they must be protected from those who might harm them. The temples must be available for worshipers at any time, and they must have appropriate shrines where worshipers can easily find and worship them. In Chengtu a few years ago a poor woman appeared and said, "I have no house to live in." Later the people decided that the strange old woman was the goddess Kuanyin and that she wanted a temple to live in. Money was raised, and a small temple was built outside the Great South Gate of Chengtu. One of the images in the temple was Kuanyin, the goddess of mercy.

The temples are also the centers of religious ceremonies and worship. Morning and evening the priests burn incense before the gods, ring the bells, and then bow and kowtow in worship. When requested and paid to do so, the priests chant their sacred books and worship the gods to cause rain, to save a departed soul from hell, to heal the sick, and to exorcise demons. Individuals and families come to the temples to divine and to have their fortunes told, and if at first their luck is divined to be bad, they make a vow and pray, then divine again in order to get their fortunes changed from bad to good. Sometimes people come to pray for sons, promising some gift to the god in case the prayer is answered. At the times of the great festivals, especially the birthdays of the gods, thousands come to the temples to worship, to visit, to enjoy the parade, to partake of the feast, and to watch the theatricals.

Personal inquiries and the local histories indicated that in the province of Szechwan a very few of the temples were erected as early as the T'ang dynasty, A. D. 618-907. A larger number of the temples were built in the Ming dynasty, A. D. 1368-1644, and still more were founded in the Manchu dynasty, A. D. 1644-1911. A good number of temples were built in the reign of K'ang Hsi, A. D. 1662-1723, and of Ch'ien Lung, A. D. 1736-1796.

Besides furnishing homes for the priests and the gods, another reason for building the temples is to accumulate merit and karma, and through a good karma to obtain a happier existence in heaven or in a future reincarnation.

Some of the temples were built by the government under the leadership of emperors, governors, or other officials. Motives for their doing so were to obtain the favor of the people, to help propagate the religion in which they believed, and to accumulate merit so as to obtain a happier future existence.

Sometimes people have believed that a god has manifested himself

through a dream, or in the person of a beggar, or otherwise, and this has led them to erect a temple to contain his image. Or a member of a family has prayed to a god to heal a sick person and the apparently miraculous recovery of the sick person has led to the belief that the god was very merciful and efficacious, with the result that a temple was built for him.

Every temple has at least one important meeting of its constituents a year, and at this meeting collections may be solicited. These contributions are used for various purposes—to give a new painting or “new clothing” to the images of the gods, to repair the temples, or even to build new temples.

When a Buddhist or a Taoist society decides to erect a new temple at a certain place, priests are sent out over a wide section of country, sometimes soliciting millions of people, most of whom contribute something. This is continued until the temple is built and paid for.

There are many sources of temple income. Of primary importance are lands and houses, which are often given by old people or devout worshippers to accumulate merit and sometimes in payment of vows. Up to about 1915 the number of properties owned by the temples of West China was very great. I was often told that in Suifu at that time about half the houses and shops belonged to the temples. At Kuanhsien and other places I was told that large stretches of farm and forest lands had belonged to the temples. Temples and their property were sometimes confiscated and used by schools, but more often they were confiscated and sold by the war lords, especially Liu Wen-huei and the Twenty-fourth Army of which he was the head. In time many individuals and organizations were guilty of occupying temples and paying little or no rent and of confiscating temples and their property, often simply because they could get away with it. In the case of schools the process seemed more justifiable and had more general popular approval. Both the temples and the schools were thought of as belonging to the people, so that if the people no longer wanted the temples and temple property for the worship of idols, they believed they had the right to change the use from worship of the gods to the education of the people. The great upsurge in popular education and the great demand for new schools were often at least partially met in this way.

People praying for healing, sons, the change of luck from bad to good, or other favors, often promise or vow to make contributions if the prayers are answered. This is a large source of income, since nobody fails to pay a vow if the prayer is answered.

Funerals, opening the way of souls to Hades, ferrying the souls across the river, praying for rain, praying souls out of purgatory or hell, and reading or chanting sacred books are some of the ceremonies performed by the priests in the homes or in the temples. The priests are always paid for these services, but prices are not fixed. Poor people pay less and wealthy people pay more, and this income is shared by the priests and the temples. There are also voluntary contributions by worshipers, and during the great festivals these contributions amount to a great deal of money, for there are thousands of worshipers.

Sometimes priests are sent from house to house, from street to street, and from town to town soliciting contributions. Generally a priest does not leave one house and go to the next until a contribution has been received. A priest taps on a bell or beats a piece of wood or bamboo while soliciting. A prolonged noise at one house means that the family is refusing to give, and it is so disgraceful to have the neighbors know this that few can endure it very long and finally make a contribution to get the priest to go along to the next house. Large sums of money are sometimes collected in this way.

By 1940 most temples had lost their property, and in many cases the temples themselves were confiscated or occupied. Contributions of all kinds had dwindled to a fraction of what they had been.

The number of priests in any one temple varies with the size of the temple and especially with the temple income, for the priests have to be fed and clothed. It is evident that during the past half-century the number of priests and nuns has diminished a great deal. In Suifu I knew a young Buddhist priest who left the priesthood and joined the army because no temple could or would support him. It is an amazing fact that among 210 temples of Chengtu in 1944, 64 had not a single priest or nun, and that in the remaining 146 temples, some of which were very large, there were only 351 Buddhist and 212 Taoist priests, and 163 Buddhist and 32 Taoist nuns. These temples, including 32 caretakers, thus had a total of only 790 priests, nuns, and caretakers to minister to the needs of 700,000 people in Chengtu and 2 or 3 million people in the nearby country.

Why do men and women leave their homes and become monks or nuns, with no families or descendants? Some boys and girls are given to the temples by their families, sometimes through a sense of guilt because of the sins of one or more of its members or ancestors. Giving a child, especially a son, is a meritorious act that will accumulate merit enough for the whole family to overcome demerits due to sin.

Or, the study and interpretation of the eight characters of a child may indicate that the child's life is to be very unlucky and that it is unlikely that he or she will live long and happily. Becoming a priest or a nun may change the luck of the child so that he can live happily to ripe old age. A family may have too many children so that one can easily be spared, or the family may be so poor that it is very difficult to support all the children, and giving one or more to the temples and the gods relieves the financial burden.

Some men have bad consciences because of their evil deeds. Perhaps they have robbed, or killed in war, or committed other crimes. Merchants may have used false weights and measures or false materials. By becoming priests they believe that they can accumulate merit to offset their sins and save them from hell, giving them a good and happy future existence. Then there are poor people who find it difficult to earn enough to provide their food, clothing, and lodging, and they enter the temples as priests or nuns because a living is provided and there need be no worry. Some enter the temples because they are very unhappy over the death of loved ones. Some women become nuns because they have been discarded and divorced by their husbands. It is said that in rare instances a man enters the priesthood as a means of avoiding punishment by the government for crimes he has committed.

There are some men who, approaching old age, although they have lived and enjoyed good, happy, and successful lives, enter the priesthood because they believe that it is a wise plan to spend their last years as a priest, cultivating their virtue and merit so as to be sure to enjoy a more happy and prosperous future either in heaven or in a future existence. For several years the head of the department of Chinese studies in the West China Union University was Feng Lao Ssu, or "Old Scholar Feng," a devout Buddhist. He finally resigned and entered the priesthood for the reasons given above.

People enter the priesthood at all ages after early infancy, but most commonly at early manhood or womanhood. I have seen boys only 6 or 7 years old in the temples, but the priests are not anxious to accept them so young because they have to be fed for many years before they are very useful. Those given to the temples at a tender age serve as apprentices and servants of the priests until they reach maturity and can be ordained as priests. The number of people entering the priesthood has diminished greatly in recent years.

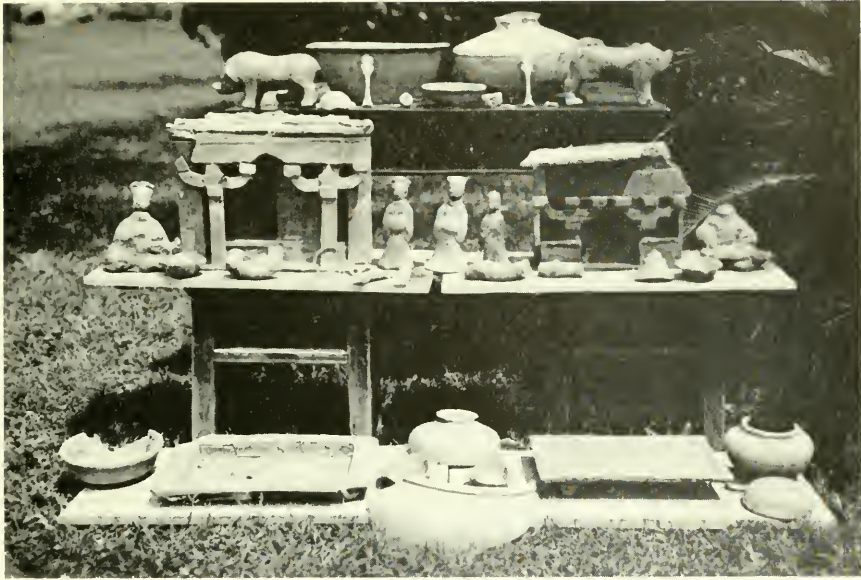
THE GODS IN THE TEMPLES

No discussion of the temples would be complete without a study of the gods and their images contained in them. Most of the Chinese people regard the images in the temples as real deities who can think, see, hear, speak, and act—the images are their bodies.

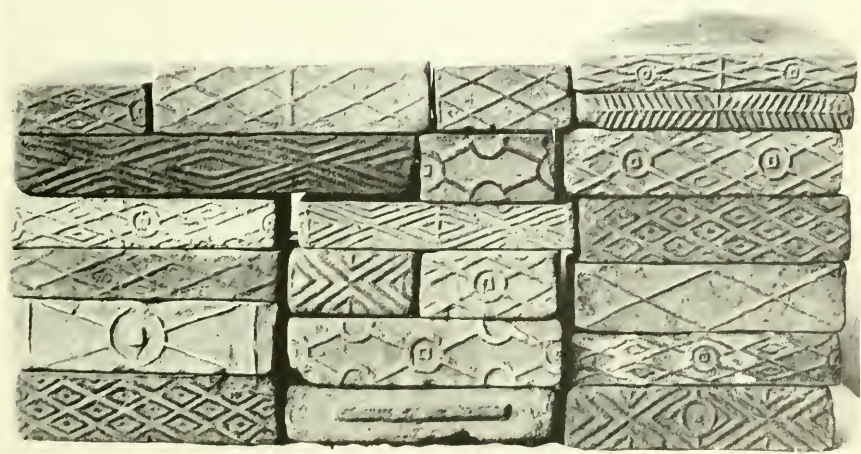
Many Chinese gods are deified men or women—important persons who were efficient and attracted attention and admiration. They were believed to have unusual powers and have been deified and are worshiped by people who wish to obtain their help. Others are nature gods who have been personified and deified. The sun, the moon, constellations of stars, even rocks and trees are worshiped as deities, but the fire god, the lord of thunder, the thunder god, and the goddess of lightning are anthropomorphic gods who control these phenomena. Many gods in China were first worshiped in India and have been brought to China by the Buddhists.

In our research we endeavored to list all the gods whose images were in the temples of Chengtu. In this we were handicapped, for in 89 temples out of a total of 210 (42.4 percent of the whole number) there was no worship at all, and all the idols had been removed or destroyed. In 93 temples (44.3 percent) there was very little worship, and most of the idols were gone. In some of the temples 30 or 40 idols were promiscuously placed in rooms where originally there were only a few, and in a few instances the idols were piled on top of each other like cordwood. A comparison with the first Suifu survey, made in 1928 before the destruction had begun, will indicate what a loss there had been in images when our later survey was made. We found 17 large temples (8.1 percent), at least partially occupied by other organizations, in which the images of the gods were complete and in which there was much worship. There were 11 temples, (5.24 percent), mostly small, in which there was worship only.

By far the most popular deity in West China, as in all China, Korea, and Japan, is Kuanyin, the goddess of mercy. In India this is a male deity, Avalokitesvara. The Chinese have a proverb, *yen fu, t'su mu*, "strict father, compassionate mother." It is regarded as characteristic of the males to be strict and harsh, of the females to be kind and compassionate. Practically all the Chinese gods are males and therefore likely to be strict and harsh and to punish. But centuries ago the Chinese felt the need, as they now do, of a god of sympathy, kindness, and mercy. Kuanyin was therefore transformed into a female, the goddess of mercy and compassion. She is believed to be so tender hearted that she will never turn a deaf ear to one who is



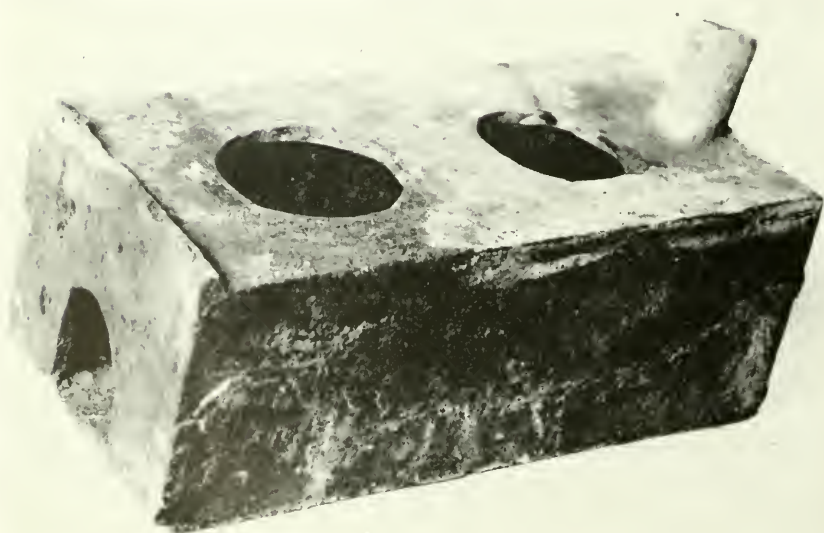
1. Objects excavated by David C. Graham from a Han dynasty brick tomb at Chung-king. They include earthenware bowls, dishes, models of human beings and pigs, a fish pond, a low table, a house, and a pavilion.



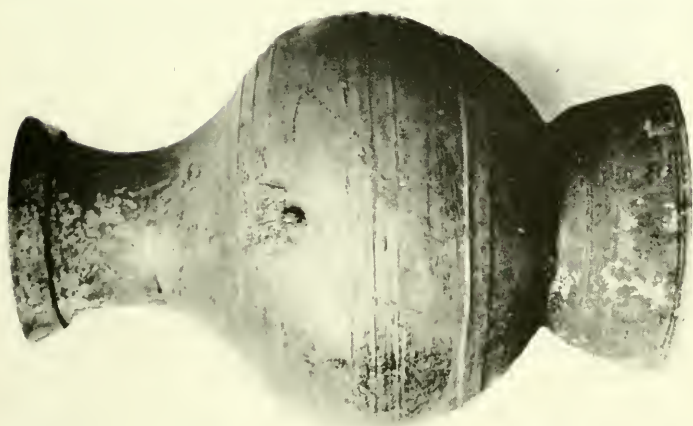
2. Ornamented bricks from Han dynasty brick tombs excavated by David C. Graham at I-pin, Szechwan.



1. A typical clay image of a dog with a ring for a leash, from a Han dynasty tomb in Szechwan.



2. A small gray clay stove buried with the dead in a Han dynasty tomb in Szechwan.



1. A typical gray clay vase or jug from a Han dynasty tomb in Szechwan.



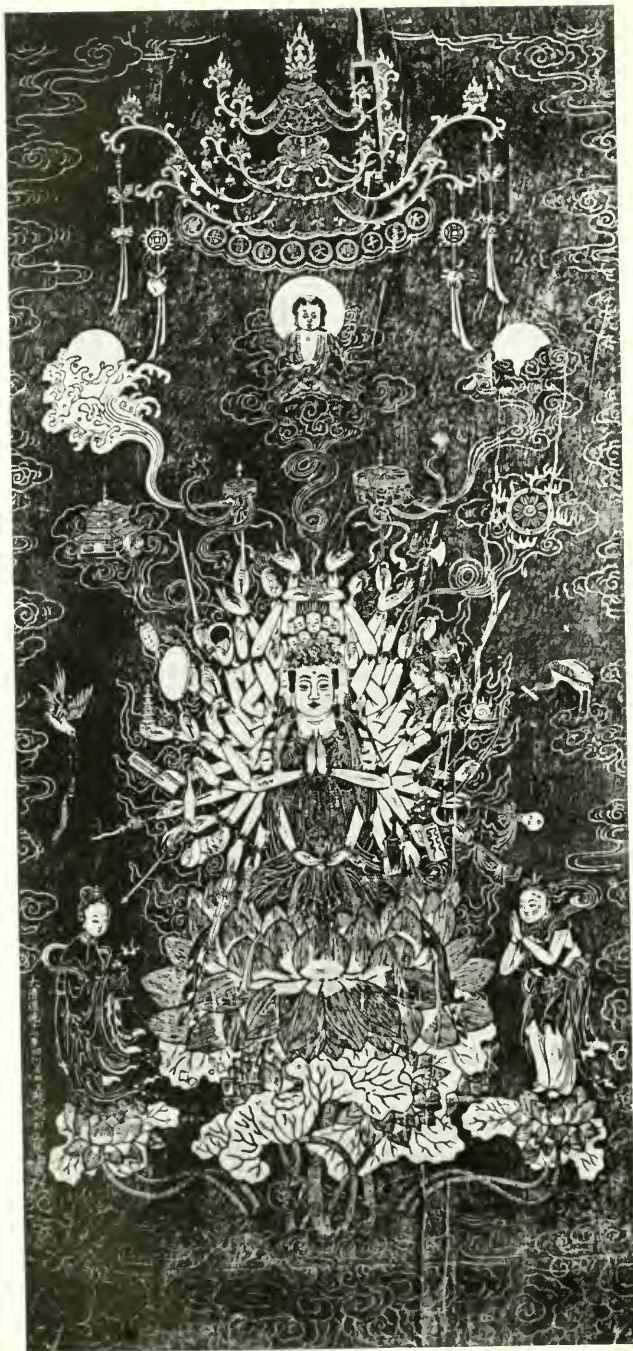
2. A gray clay image of a warrior with a shield and a sword, from a Han dynasty tomb in Szechwan.



Picture from a rubbing of a stone tablet in the Wenshu-wan monastery in Chengtu. It is Kuanyin, the goddess of mercy. The inscription implies that the original, which is probably lost, was drawn during the T'ang dynasty by the famous Chinese artist Wu-Tao-tzu.



Picture of a Taoist painting of Shou-hsin, the god of long life. Note the gray hair, the prominent forehead, and the long fingernails and eyebrows.



A Chinese thousand-armed goddess of mercy. She has many heads, and supposedly 1,000 arms and hands. There is an eye in the palm of each hand. She sits on a lotus flower, worshiped by two attendants. A Buddha emanates from her head, and above is a beautiful canopy.

in trouble and appeals to her for help. Sometimes she takes the form of a king of demons in hell to help save people who are suffering there—formerly there was such a god in the Taoist Green Goat Monastery at Chengtu. Sometimes she carries a baby and is the Kuanyin That Gives Sons. Sometimes she has one thousand hands and arms and several heads so that she can hear and succor anybody who is in trouble and appeals to her for help. A thousand-armed goddess of mercy sometimes has an eye in the palm of each hand. Kuanyin was noted 49 times in the temples of Chengtu. She is also often found in private homes.

Second in popularity in the Chengtu temples is the literary god of wealth, found 45 times. With wealth a person or family has prestige, power, honor, social position, and leisure. One can hire servants to do the "bitter work," and all debts can be paid. The desire for wealth is very strong in West China.

Third in frequency in Chengtu is Sakyamuni, found 35 times. He is the founder of the Buddhist religion and is highly honored among Buddhists. He is said to have rejected all gods, but his followers have deified him and believe in and worship many gods.

Fourth is Kuan-yü, a great hero and warrior and a man of virtue and high character who lived at the close of the Han dynasty and the beginning of the Three Kingdoms. Until his death, he loyally supported and fought for the last emperor of the Han dynasty, Liu-pi, whose grave is in the grounds of a Taoist temple outside the Great South Gate of Chengtu. The image of Kuan-yü is found in the temples 24 times, and he is worshiped by officials, warriors, and members of secret societies.

Fifth is Wei-t'o, protector of Buddhist law and Buddhist temples, whose image was found 21 times. Clad in ancient armor and holding a sword, he is found near the main entrance facing the interior of the temple.

Images of four different deities were reported as occurring 18 times. They are the fire god, who protects homes and cities from fire, the goddess who gives sons, the goddess who helps mothers have a quick and easy delivery, and the goddess who heals measles and smallpox.

Occurring 17 times each are the god of pestilences, who controls and causes pestilences, and Ti-chang, the god of hell, who can save from or condemn to the punishments of hell.

Occurring 15 times each are Wen-ch'ang and Wen-shu, both of whom are worshiped by students and scholars, who believe that these gods will help them attain learning and become good scholars.

Three gods occur 13 times. One is Lei-chu, the god of thunder, who is feared and worshiped because he causes the terrible thunder and lightning that are so fearful and so harmful. If he is worshiped he will protect people from this danger. Yo-wang, the god of medicine, is the patron deity of doctors and those who sell medicine, and he also helps heal those who are sick. Also found 13 times is the Big Dipper goddess, who controls birth and death. It is said that each person has a star in the sky—great persons have large stars and little people have small stars. When a “falling star” is seen, the people believe that some person has died.

Ling-kuan or Ling-chu occurs 12 times. He is the protector of Taoist law and temples, and is par excellence an exorciser of demons, for generally his mouth is wide open from wrath and with his war club he fiercely strikes the demons and drives them away.

Yü-huang, the Jade or “Pearly” Emperor, is one of the highest gods of the Taoists. Once a Chinese man, he so cultivated his religious knowledge and virtue that he finally became the ruler of the sky and the Jade Emperor.

Six gods occur nine times. They are, first, Li-lao-chün, the Old Gentleman Li, sometimes called Lao-tzu, or Old Boy, because of the tradition that when he was born he was already 70 years old and had gray hair. He was the founder of Taoism and is said to have written only one treatise, the Tao-te-ching, or the classic of doctrine and virtue. The second is P’u-hsien. He is the patron deity of Mount Omei and is said to have ridden a white elephant to that mountain. His statue is in many Buddhist temples, always riding a white elephant. Third is Ti-mu, the earth mother, who lives under the ground and causes everything to grow. Day and night she watches the scorpion which holds the earth up on top of its body. If she did not watch, the scorpion might turn and let the earth crash down, with dire results. Then come the three rulers—the sky ruler, the earth ruler, and the ruler of water. The sky ruler controls everything that has to do with the happiness of mankind. The earth ruler controls the earth, and the water ruler, the water.

Five gods were found eight times each; 3, seven times; 3, six times; 11, five times; 7, four times; 21, three times; 19, twice; and 29, once.

It should be noted that Wang-yeh, the boatmen’s god, is 25th or 26th in Chengtu, occurring eight times, while in Suifu he is sixth, not excluding the Buddhas and those that are merely the attendants

of other greater gods. The military god of wealth is fourth in Suifu, and the literary god of wealth stands high in Chengtu. Wen-ch'ang, the god of learning, is fifth in Suifu, and much farther down the line in Chengtu. It is quite possible that the complete destruction as places of worship of 42 percent of the temples and their idols in Chengtu, and the very near destruction of an additional 44 percent, has resulted in the destruction of a larger proportion of the images of some of the gods than of others.

The frequency with which a deity occurs in the temples of any locality is a clue to the main interests of the people of that region. For instance, in the first Suifu survey it was found that except for the Buddhas and the attendants, the most popular god was Kuanyin. Second came the military god of wealth, and third Wen-ch'ang, the god of literature and learning. Wang-yeh, the boatmen's god, came fourth.

It has already been noted that almost every Chinese god is the patron deity of some occupation, and every occupation, great or small, has at least one patron deity. Some gods are patron deities of several occupations.

THE NUMBERS OF THE TEMPLES

To the reader the assembling of the facts in this section may seem to be a comparatively simple task, but on the contrary, it proved to be exceedingly difficult. Our aim was perfect accuracy, and to this end I carried on the survey, assisted by from one to three university students, during parts of four years, a total of three years actual time.

We first obtained copies of the history of Hua-yang-hsien and of Chengtu-hsien and recorded their lists of temples. Nearly half the temples mentioned in the histories could not be found. We also tried this method with several other cities in Szechwan and in Sikang, with a similar result. Either the names of many of the temples had been changed, or else many temples had disappeared and others had been erected in their places. We therefore adopted the method in Chengtu of going to every street and alley and very carefully looking and inquiring. Sometimes this had to be repeated several times before adequate results were obtained.

Many temples had been confiscated and sold in the past half century or had been changed and were being used for other purposes. The streets and alleys had been widened, and the gates or fronts of

some of the temples were so completely changed that they could not be recognized. Very often the only hope of finding any trace of a former temple was to search for and find former residents, generally old people, who were willing to talk. Many people were afraid to talk, fearing that we might be agents of organizations looking for temples or former temples to confiscate or even to recover old temples and restore them to their former uses. It is likely that there were some temples in Chengtu that had disappeared within the last 50 years of which we failed to get information, and this is undoubtedly true in every other town and city that we studied, with the possible excep-

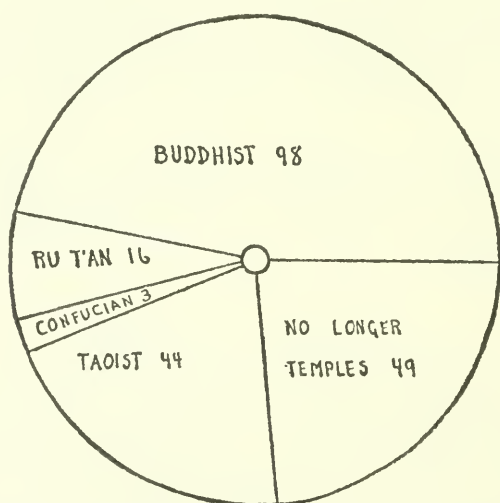


FIG. 9.—Numbers and kinds of temples in Chengtu.

tion of Suifu. People had forgotten about them or were unwilling to talk. The destruction of the temples was even worse than our researches showed it to be.

In Chengtu and in the near suburbs we found traces of 210 temples. This did not include the Mohammedan mosques. There were 120 inside the city, and 90 outside. In Chengtu-hsien there were 109, 68 inside the city and 41 outside. There were 101 in Hua-yang-hsien, 52 inside the city and 49 outside. Of these 98 were Buddhist, 44 were Taoist, 16 were Ru-t'an, 3 were Confucian, and 49 were no longer temples, so that they could not be classified according to their religion. Of the total, 110 were large, 69 medium, and 31 small; 47 were in good repair, 73 medium, and 90 in very bad repair.

THE USES OF THE TEMPLES

Practically all the temples of West China were built for worship only. But there were great changes in West China, and indeed in all China, during the first half of the 20th century, and it came about that by 1948 less than 10 percent of the temples were used for worship only, and in nearly 90 percent there was little worship or none at all. These great changes were manifestations of a political, social, psychological, and religious revolution. In Chengtu the temples that were used exclusively for worship were mostly small ones that were not useful for other purposes, and the 17 that were used for other purposes but also had many worshippers were usually large, famous old temples that had much prestige.

During the last Japanese war and World War II, the population of Chengtu increased from 500,000 to 700,000. Some houses were destroyed by Japanese bombs. Rooms, houses, and apartments were hard to rent, and rentals were high. This explains the fact that in our survey we found that more temples—56 in all—were being used as apartments than for any other purpose. Those who lived in these apartments were generally poor people who earned their living with their hands. They often lived in a single room, and most families had several children. Rooms were separated from each other by plaster walls or by bamboo mats. Most of these temples were in poor repair.

During the years from 1927 to 1937 the national government of China greatly increased the number of public schools. The aim was to make the people literate and intelligent so that they could learn to be good citizens in a democratic country, and gradually to increase their powers as citizens as rapidly as they learned and showed themselves capable of using them. But school buildings and school property were very expensive. Both temples and schools were regarded as belonging to the public. Since temples and temple property were being confiscated and used for other purposes, why not for schools? To the people it seemed that if they were not to be used for worship, this was their most appropriate use. In Chengtu in 1944 the second largest number of temples—a total of 49—were being used as schools, mostly primary schools.

One-sixth of the temples of Chengtu were used as barracks for soldiers. After the fall of Yuan Shih K'ai in 1916, war lords seized power. To increase their military strength they greatly augmented their armies. They so overtaxed the people that the tax burden was almost unbearable. One war lord in Szechwan collected 32 years of

taxes in advance, but heavy taxes were also collected at least once a year after that. Soldiers often helped themselves to the food and other possessions of the people, and were frequently billeted in homes, paying nothing for the privilege. They often took possession of temples and used them as barracks without paying any rent, often removing the idols and allowing no worship inside. The people generally disapproved, but they could do nothing about it. In Chengtu 34 temples were used as military barracks.

Fourth in number in Chengtu were the temples occupied by chari-

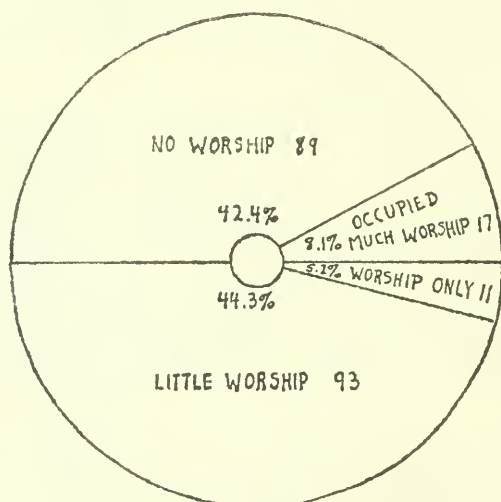


FIG. 10.—Classification of Chengtu temples according to the amount of worship.

table organizations. During the war the number of orphans and lost or cast-away children increased greatly, and temples where "warphans" were cared for were many. There were also temples occupied by beggars and by very poor old people. A total of 32 temples were used by charitable organizations.

Twenty-six temples were used as police stations. The police were glad to get possession of a temple, for the buildings and the rooms were large and convenient. They generally chose temples that were strategically located so that they could move around the city quickly and conveniently in an emergency.

Seventh in number were the temples used by public officers. Generally their offices were not very large, and the temples could also be used for worship or for other purposes.

Thirteen temples that had been confiscated or purchased had been altered into private residences for wealthy and powerful families. All idols and priests had been removed, and they were no longer places of worship.

Thirteen temples, mostly large ones, were used as factories. They were generally in bad repair, and the machines and materials littered up the rooms. Throughout the day there was the noise of machines and the workers, and they were thus not suitable places of worship.

In China the teashop is a popular social rendezvous. There a person can, for the payment of a small sum, sit for an hour or more and talk with friends while drinking tea that has been purified by boiling. Many temples were used as teashops, most of which paid rentals, but the chatting of friends did not create a suitable atmosphere for worship.

Eleventh in order were the temples occupied by stores or shops. All the stores are located in the front of the temples, near the main entrance. Such temples often left their idols in the rear to be worshiped, but near the entrances the temples did not at all resemble places of worship.

Six temples, generally small ones, were occupied by fire brigades. Five were used as rice markets; in these the atmosphere of quiet worship was changed to that of a noisy market. Three were used as lumber markets and carpenter shops, with accompanying noise and litter. Three were occupied by river-tax offices, where taxes were collected on boats and their contents.

During the years 1937 to 1948 the national government of China encouraged cooperatives as a means of supplying goods that could not be imported because of the Japanese blockade. Three temples were used by the cooperatives, which treated with respect the priests, the idols, and the worshipers.

Three large temples were occupied by military schools; all the priests and idols were removed, and there was no worship. Two were used as Buddhist theological schools; here books were translated and written, scholars came to study and to improve their knowledge of Buddhism, and pupils were taught. Two large temples were used as dispensaries, two as theaters, two as hotels, two as ricksha stations or headquarters, and two small temples had been made into public toilets. One temple each was used by a military band, a youth organization, a school for teaching Chinese medicine, a cat and dog market, a vegetable garden, and a fire lane. In many of these temples there was no longer any worship.

To summarize our findings: In 89 temples (42.4 percent of the total) there was absolutely no worship. In 93 temples (44.3 percent of the total) there was very little worship. These temples were obviously on their way out as places of worship. Only 11 temples (5.3 percent) were used for worship only, and most of these were small. Seventeen temples (8.1 percent) were occupied and used for other purposes, but in them there was still much worship. A total of only 28 temples (or 13.4 percent) were used primarily for worship. Something very serious had happened to the temples of Chengtu.

SURVEYS OF TEMPLES IN OTHER CITIES OF WEST CHINA

No exact figures can be given for the number of temples in the cities of Szechwan in 1911, at the beginning of the Chinese Republic. Every important city had at least one history or gazetteer, but we found that the lists of temples in those gazetteers were incomplete. In the cities that we studied, we found that at least half the temples had changed their names, or else they had ceased to exist and other temples had been erected in their places.

Suifu, in 1928, before the destruction of its temples began, had a population of 100,000 and 83 temples within a radius of 4 miles. Chio-ch'i, 120 *li* up the Min River from Suifu, with a population of 5,000 and surrounded by a rich farming district, had 15 temples. Li-chuang, 60 *li* down the Yangtse from Suifu, had a population of 20,000 and 20 temples. Chengtu, with about 500,000 people, had at least 210 temples. These were typical cities and towns and can be used to estimate the original number of temples. Where the proportion of temples is considerably less, it is because a goodly number of them have been destroyed or changed into buildings to be used for other purposes.

Chungking, the commercial capital of Szechwan, is situated at the juncture of the Chia-ling and the Yangtse Rivers. Before World War II it had a population of at least 500,000. During the war with Japan the capital of free China was moved to Chungking, and in time the population was reported to be at least 1 million. During the war it was bombed by Japanese airplanes nearly 300 times and was reported to have been the most bombed city in the world. Through explosive and incendiary bombs a large part of the city was destroyed, including homes, shops, and temples. Many homes and shops were crudely and hastily rebuilt, but only one of the temples. Practically all the temples were confiscated and occupied and used for other purposes. Because of the great increase in population and

the air raids, the destruction, confiscation, and use of the temples for other purposes was much greater than in Chengtu. When passing through in 1948 I could learn of only one temple, Buddhist, that was used for worship only and was prospering. I visited this temple and talked with the friendly priests.

A little less than 40 miles west of Chengtu is the city of Kuanhsien with about 30,000 inhabitants. It is situated just at the end of the Chengtu plain and the beginning of the mountain ranges beyond. Citizens informed us that during the past 30 years war lords, especially Liu Wen-huei and his Twenty-fourth Army, had confiscated and sold practically all the property belonging to the temples and many of the temples themselves. Even the Er-lang Miao and the Hu-lung Miao, which were so important to the ceremonies connected with the irrigation system of the Chengtu plain that they could when necessary obtain financial grants from the government, were glad to rent rooms to guests who wished to spend their vacations in the temples. We found that all the other temples in or near the city were occupied and were being used for other purposes than worship.

At the Yang-tzu-lin temple, a Taoist temple on top of the pass between Kuanhsien and the upper Min River valley, the priests reported that all the temple property from which income was derived had been confiscated and sold by the Twenty-fourth Army. Many temple rooms were divided into smaller rooms by means of partitions and rented to guests, and a restaurant and teashop were opened in the temple. So many travelers stopped in the temple to stay overnight or to eat or to drink tea that there was a goodly income from this source, and the priests and the temple got along fairly well.

Wei-chou is a city of nearly 10,000 inhabitants, situated at the juncture of the Min and the Tsa-ku-nao Rivers. It formerly had more than 10 temples, but in 1944 there were only 2. In 1925 I saw just above the city a large temple with idols made of white quartz or white marble, all of which had been broken, although we could not find out by whom. In 1944 only a few foundation stones were left of this temple. In 1941 I was informed that all the temple property and most of the temples had been confiscated by the officials and used to construct a public park. In 1944 a large temple on a hill near the city was used as a normal school. The idols were partitioned off by bamboo mats so that the pupils could not see them, and there was almost no worship. A small temple in the city was used only for worship, but it was in very bad repair.

On the way from Wei-chou to Mao-chou one passes through Pai-

shui-ch'eng, or White Water Town. Formerly there were seven or eight temples, but the town was completely wiped out by the flood of 1933. The town was rebuilt on a higher elevation, with four temples. Communists or Chinese government soldiers actually tore down two of them for firewood, and they were not rebuilt. In 1941 there were two temples, one Buddhist and one Taoist, although in poor repair and with no priests.

I have actually seen Chinese temples being torn down. In 1929 a large temple was torn down at Kung-hsien, and shops and residences were built in its place. In 1928 and 1929 two or three temples were made into market places in Suifu, and four large temples were torn down to make place for a public park. In November 1942 the famous Nan-t'ai-ssu temple at Chengtu, near the West China Union University, was being torn down by soldiers to make way for a public road. In Chia-Chiang I noticed two stone lions on an empty plot of ground and was told that formerly there was a temple on the spot. Most temples were not torn down, for the buildings were valuable, but were altered and used for other purposes. Inside the East Gate of Lo-shan there was a very large temple of Kuan-yü. First it was occupied by a girls' middle school, then the images of the gods were all removed except that of Kuan-yü. This was left because he was a famous hero, but it was not worshiped. Finally the name of the temple above the main entrance was removed and the name of the school placed there in its stead. Thus was completed the transformation of a large temple to a girls' middle school.

Mao-chou is a large town up the Min River from Wei-chou, probably once having 15 temples. The flood of 1933 and the Communists had destroyed nearly all the houses and temples, but about half the houses had been rebuilt when I last visited the city in 1941. The two best temples were in a dilapidated condition. The flood had washed away the clay on the idols, leaving a wooden core surrounded by straw. A priest from the Chao-chio-ssu temple in Chengtu had hired one worker to repair the idols as fast as he could raise the money to pay for the work, which was slow. The temples of Mao-chou had almost ceased to exist.

Ya-an is a city of more than 25,000 people, the capital of Sikang and of the Yachou Prefecture. In the prefecture alone there are probably half a million people. With the help of Chinese friends I made a survey in 1944 of the temples in the city and within a radius of about 30 miles. In all we found 117 temples. Forty-two of these, mostly in the country, were being used exclusively for worship, 17

had ceased to be temples and were not used at all for worship, 36 were in bad repair, 12 were being used for schools, 7 as soldiers' barracks, 4 for residences, and 2 each were being occupied by factories, poorhouses, and military arsenals. One each was in use as an agricultural experiment station, a secret society center, a military headquarters, a bus depot, a beggars' home, a rice-tax office, a granary, a police office, a horse stable, a post office, a theater, a youth organization, and tile market. Apparently all the property and some of the temples had been confiscated, and the process of taking over temples for other purposes was going on steadily, for "possession is nine points of the law."

Three years later I was again in Ya-an for a short time, and a check was made on the temples of the city. In all there were 15, which was less than half their original number. Of these temples three were in ruins, and in at least four there was no longer any worship. Every usable temple was being occupied and used for other purposes. In only one was there much worship, and only one was in good repair. A total of 33 temples had been destroyed or had ceased entirely to be temples.

Hung-ya is the first large city down the river from Ya-an. In 1945 I made a list of all the known temples in and around the city within a radius of about 10 miles. Recently there had been only five temples left in the city, but in three of these there was no longer any worship, and the other two were occupied and being used for other purposes. Outside the city there had been in recent years 20 temples. Five were occupied, nine were used for worship only, and six were reported as having been destroyed.

Chia-chiang is a large city about 70 *li* up the Ya River from Lo-shan. Like many other cities in Szechwan, it is a walled city surrounded by a fertile farming district. During a visit to Chia-chiang in December 1945 the following information was obtained.

In the city and within a radius of 10 miles were 30 temples, 4 in the city and 26 outside. Three temples in the city and two outside were reported to have been sold and destroyed; the other temple in the city was occupied by a military school. It seems a very safe guess that at least 15 former temples in the city had ceased to be temples for so long that they were not reported to us. Twelve temples outside the city were used for worship only; some of these were too small and others too far away to be used for other purposes. Several of these were in a poor state of repair. Twelve were occupied and being used by one or more organizations. Three temples were used

as schools, two as waterpower plants, and one each by a youth organization, a military center, a post office, a theater, a charity organization, and a barracks for soldiers.

Between Chia-chiang and Lo-shan is the small town of Kan-chiang-p'u, with a population of about 3,000. I visited it several times and in September 1944 obtained the following information. There were then left only five temples in and near the town. The Kuang-ch'eng-miao was a large temple completely occupied and used as a granary to store rice collected as taxes and for the tax offices, except for one medium-sized room. In this room all the idols from all over the temple had been stored, standing close together in disorder. Occasionally, but rarely, someone would come in and worship these idols.

A second large temple, the Yü-wang-miao, was occupied and used by a police station and its offices. All the idols were placed in the rear and fenced off, with very little worship. A third large temple was the Wang-yeh-miao, the temple of the god of boatmen. It was being used as a lower primary school. It was the best temple in the town, but all the idols had been removed and there was no worship inside. A fourth temple was the Hsiang-kung-miao. It was being used as a butcher shop where cattle were being cut up into beef and sold. In it there was almost no worship.

Across a nearby creek was a very small new temple that had been built around a pagodalike "word-treasury." A god had revealed himself and told a sick man how to get healed. The man got well, which proved that the god was alive, wise, compassionate, and efficacious. The temple was then built, too small to be useful for anything but worship. In this temple are Wang-yeh, Kuanyin, and Ku'ei-hsin, the god who helps students and scholars.

Lo-shan is a city of 100,000 people situated at the juncture of the Min and the Ya Rivers. During World War II it suffered severely from Japanese air raids; many buildings were destroyed, and many city blocks of buildings were burned. In this way many temples were lost, and none were rebuilt. We made a careful map of the city with the location of the temples and obtained information about their condition and uses. Out of about 70 temples, we found only about 20 that could still really be called temples. The only temple not occupied and used for other purposes was one about 30 feet square, too small to be coveted. One temple was used as a police station, and all the idols had been removed. Several large temples were used as barracks for soldiers, and while not all the idols had been destroyed, those re-

maining were concealed behind bamboo mats, and people were not allowed to go in and worship. Several temples were occupied by schools, and a small temple was used as a fire station. One temple had been occupied by government offices so long that most people did not know that it had ever been a temple—we got the information from an old man who had lived on that street for years. Wu Han University was occupying and using several large temples for recitation rooms, offices, a middle school, and a library. One temple was a large teashop, with idols worshiped in one large room. No temple that was destroyed by bombs or burned down was rebuilt, and some temples were sold. While Lo-shan is on the way to Mount Omei and many thousands of pilgrims pass through it every year, its temples were in a much worse condition than those of Suifu or Chengtu.

P'eng-shan is a large walled city above Kiating between Chiang-K'ou and Mei-chou. In this city we found and listed 15 temples in 1945, and no doubt a larger number had already disappeared or been transformed into buildings with no worship and housing other institutions. Not one temple was being used for worship only. Four were being used as schools, five as military barracks, and one each as a theater, a government rice granary, the headquarters of the board of aldermen, headquarters for the Peoples' Party or the Kuo-min-tang, a sulphur factory, and an arms factory. In all these temples there was little or no worship.

In 1944 we made a study of the temples of Ch'ien-wei, a large city on the Min River 35 miles down the river from Lo-shan. A conservative estimate of the number of temples in this city in 1910 would be 35 or 40, but we found only 9 temples in and outside the city. The very large Ch'eng-huang-miao was occupied and being used by a cotton-cloth factory and a theater, and three-fourths to four-fifths of the idols had been removed and destroyed. In this temple there was very little worship. The large Confucian temple was occupied by a girls' school, the Buddhist temple Nan-hua-kung by a primary school, the Ch'uan-chu-miao by the Chamber of Commerce, and most of the idols were removed. The large Buddhist temple An-lo-miao was being used as a military barracks. The temple on a hill near the city, Cheng-wu-shan, was a regional office for receiving and transmitting air-raid alarms. The temple outside North Gate called Feng-lai-shan, or Phoenix Came Mountain, was a barracks for soldiers. The Kuan-yo-miao outside North Gate was a granary to store rice received as taxes, and a place for offices. The temple of the fire god, also outside the city, was a military barracks. We were

told that at least four temples had been torn down and sold within the past few months. There were people in the city who wanted to worship, but most of their worship had to be performed in temples too far away from the city to be useful for other purposes, or on Mount Omei, the sacred mountain not too far away. Even among the distant temples, some were going to ruin, some were being torn down and the materials used elsewhere, and some were being occupied by schools and other organizations.

The first survey of Suifu, already mentioned, made in 1928 before any of the temples were seriously occupied or destroyed, showed 83 temples. In the 1946 survey made by Chou Hsin-jen, who assisted the survey at Chengtu, there were only 45 temples—38 had disappeared, some torn down, and some used for other purposes. Of the 45 that were counted, 2 had very recently been destroyed, 1 by fire. Out of the total, 13 temples were in good repair, 10 in medium condition, and the remainder in poor repair. In 23 there was no worship at all. In 11 there was little worship, and in 14 much worship, in some, however, only at special times.

As to the use of the temples, 15 were being used as barracks for soldiers; 9 were occupied by schools; 7 were used as residences or apartments; 4, mostly small temples, were used for worship only; 2 were used as godowns; 2 each were used as rice granaries, police stations, and teashops; 1 each was used as a theater, a library, and a public office. All this means that of the 83 temples formerly in and near Suifu, 61 had ceased completely to function as temples. All the rest except four were occupied and threatened with extinction.

Our studies of Chinese temples in West China began in 1921, the surveys in 1928, and these continued until the spring of 1948, when I finally left China. Something very serious was happening to the religions of the Chinese, and the temples were like a thermometer by which this could be imperfectly measured. Between 1911 and 1948 more than half the temples of Szechwan had been destroyed or occupied and changed into buildings in which there was no worship. Three-fourths of the remaining temples were occupied, being used primarily for other purposes, and worship was a minor affair. These temples were "gasping their last breaths." Most of the temples that were used exclusively for worship were either too small or too far away from city populations to be useful for other purposes. What was taking place was the greatest social, psychological, and religious revolution in the history of the Chinese people.

CONCLUSION

Some of the conclusions that we draw from our study are as follows:

1. Primitive ideas and types of thought were very prevalent in the past among the uneducated and unsophisticated Chinese, so that the religion of the common people was very primitive. This is also true of many millions of other people in Asia, Africa, and in other parts of the world. But a new age of enlightenment is now dawning, when primitive customs and types of religion will no longer be acceptable to the people. Religions such as Buddhism and Taoism in China that have based their programs and appeals to the common people on primitive ideals and practices will have to reform radically or lose the allegiance of the people.

2. Interracial, international, intercultural, and interreligious contacts can be of great benefit. Practically every religion has something of value to contribute, and this should be appreciated, evaluated, and made positive use of by all concerned.

3. Any religious organization sending its representatives or missionaries to another country should aim to send its best. There is great need for religious statesmen today, people who have the best in education, who can give the fairest and best possible interpretation of their own religion, who can see and appreciate the best in other religions and cultures, and who are as willing to learn from others as to teach. Sincere humility does much to disarm opposition.

In Rangoon in 1940 I had friendly contacts with an Indian Christian, from whom I learned much about Indian art and culture. Once when Gandhi was mentioned I said, "My idea of Gandhi is that he is a man who does not call himself a Christian, but who in some ways is more Christian than I am." Said my Indian friend, "If more missionaries had that attitude, more Indians would become Christians."

4. In the preparation of religious leaders in the future who are to be missionaries to other peoples and to other cultures, a knowledge of the world's great religions and the history of these religions is very important. Who were the founders? What kind of men were they? What were they aiming at, and what did they teach? Some of these founders—Confucius, Buddha, Li Lao Chün, the founder of Taoism, and Zoroaster—were great religious leaders with high moral and religious ideas and teachings, but their later followers sometimes failed to maintain their high moral and religious standards.

5. A knowledge of the psychology of religion, including that of primitive religions, is very helpful. In many parts of the world there

are still people who live in primitive conditions, and many whose beliefs and practices are primitive. One should know what these people are thinking about and what they are seeking in order to be able to arrange a helpful program of moral and religious education.

6. The aim should be to develop well-educated, well-trained native religious leaders and to give them responsible positions when they are capable of assuming them. The history of religion emphasizes the importance of good native leadership if a new religion is to become well established among a new people. The old word "devolution" sounds a little like going to the devil, but at its best it is the opposite. The training and use of worthy native leaders is of primary importance in the establishing of indigenous churches or religions.

7. Many cultural groups have native arts, architecture, music, and moral and religious ideals that are high and worthy. The native religious groups should be encouraged to use them in order to make a new religion indigenous. What is of value in native culture and customs should not be destroyed but used for the benefit of the people. This can be done without losing anything of value that the new religion has to contribute, and it can enrich and greatly aid in the spread of the new religion.

FILIAL PIETY

In 1944 Bishop Soong, who was then pastor of the Chengtu Episcopal Church, published an article in the *Christian Quarterly*, of which Y. T. Wu was editor, in which he said that in the past missionaries had been very much mistaken in their attitude toward filial piety, and that there was nothing in the Chinese practices of filial piety that Chinese Christians could not and should not approve and practice. He quoted a number of passages from the Christian Bible to support his position. In the next issue of the *Christian Quarterly*, several Chinese Christians severely criticized Bishop Soong and the ideas that he had expressed. One writer closed with the statement, "Bishop Soong, you are not fit to be a Christian Bishop. You ought to be a Confucian Bishop."

Some time after this Y. T. Wu and I met and discussed the articles on filial piety. I made a few remarks, based on my observations of life in China. Said Mr. Wu, "You write that down. I want to publish it in the *Christian Quarterly*." I did so, and it was translated and published in the next issue of the *Christian Quarterly*. The English version is given below. Strange to say, the Chinese leaders apparently accepted this article as satisfactorily settling the question,

for no more discussions were published in later issues of the *Christian Quarterly*.

A few days after the article was published, I met Bishop Soong at an afternoon party. He warmly shook my hand and said, "I want to thank you for that article. You see some good in filial piety, but there are some Chinese who see no good in it."

CHRISTIANITY AND FILIAL PIETY OR ANCESTOR WORSHIP

DAVID CROCKETT GRAHAM

Thoughtful Christian leaders throughout the world are more and more realizing the importance of making Christianity indigenous. This means that the best in native art, architecture, ethics, and religion should be employed by native Christian churches. Native architecture should be used in the erection of churches, native art in the ornamenting of church buildings and in portraying in pictorial form Christian stories and scenes. Native tunes should be employed in Christian hymns, although not to the exclusion of the world's best Christian music, and native Christian hymns should be written to express the creative religious experiences of the people. The best of native moral and religious ideals and teachings should be used where possible to enrich Christian instruction. Making Christianity indigenous in these ways would remove the handicap of being a foreign religion, and at the same time a contribution would be made to world-wide Christianity through the enriching of Christian art, ideals, and hymnology. Says Dr. Daniel Johnson Fleming, author of two books which display oriental art in Christian painting and architecture:

"One of the obvious gains for the younger churches from indigenous Christian art is that it helps to remove the foreign aspects of Christianity. It helps to dissipate the deadly prejudice which regards the church as an alien cult. In these days of excessive nationalism, the more our universal faith can be freed from the distinctively western accessories the less likely it is to be boycotted in some anti-western trend. That there are western accessories is manifest when an African priest can say that 'For a Bantu to be a Christian was to behave like a white man,' or when we are told that a madonna of the Italian type, holding her baby in a way unknown to an African mother, remains an alien.

"One way of bringing about this naturalization of Christianity so much needed and well justified is to use, in the various arts, forms and techniques which are native to any given people—to use their artistic language just as we already use their literary language." (Fleming, 1938, p. 2.)

In making Christianity indigenous, there is danger of lowering its standards. Such a thing happened when Constantine caused most of the Roman Empire to become nominal Christians. Christianity did not transform heathenism, but heathenism transformed Christianity, and this was one of the greatest calamities in the history of Christianity.

There are high moral and religious ideals in the teachings of Lao-tzu, Confucius, Mencius, Mo-tzu, and others, so high that they are worthy of employ-

ment by Christians. There will be a real loss to the Chinese if these ideals and teachings are forgotten.

There is so much good in filial piety that we need not take time to discuss it. We would merely suggest that the strong emphasis on the duty of filialness on the part of the children should be balanced by an emphasis on the duty of parents, to do the best they can for their children, physically, mentally, morally, and spiritually.

Ancestor worship is closely related to filial piety. It is unfortunately named in English, which makes it more difficult for occidentals to judge it fairly. There are high and noble sentiments in ancestor worship, which might better be called the ancestral cult. The fundamentals of the ancestral cult in China are love, reverence, gratitude, and respect for parents and other ancestors. To lose the best in "ancestor worship" would be harmful to the Chinese and to Christianity.

During the past centuries of human history the people of all races and nationalities have had to come out of ignorance, superstition, and comparative savagery into an age of enlightenment, and the highest stage of enlightenment, the perfect society, is still in the future. Worse criticisms can justly be made of occidental customs, at least if we go back a few decades or centuries, than I now offer about the Chinese practices in the ancestral cult.

Enlightened Chinese do not regard the ancestors as gods, so that to them the practice of the ancestral cult is not idolatry. But the more ignorant masses in China do regard the deceased ancestors as deities. They have a proverb, "Living they are men, when dead they are gods." Christian enlightenment should enable a family to commemorate deceased ancestors with love, gratitude, and reverence, without the idea that they are gods.

In China a family, to pay for a costly funeral or a very expensive grave, will sometimes go so deeply into debt that the descendants are handicapped for decades. This should be discouraged.

With the idea that the deceased ancestors need food, clothing, houses, money, etc., vast sums of money are expended on offerings and the burning of "paper money." This is a waste, and new and better methods should be found.

Many persons believe that the soul of the dead person lives in the ancestral tablet, and that the deceased ancestor is a deity. If the ancestral tablet should be retained, it is important that the idealism in this custom be changed.

The belief that the deceased ancestor, if not offered spirit money and food, will become a demon and harm people, will not appeal to the intelligent Chinese now or in the future.

Old customs that are good and not harmful may and should be continued. In some cases, like the Christian Christmas festival, the old custom may well be continued with a new and better interpretation. But if the old custom, like footbinding, is harmful and cannot be given a new and better interpretation, the custom should be discontinued or a better one substituted for it.

The above statements are not perfect and can be improved upon, but the fact that the Chinese religious leaders were seriously facing these problems and had invited me to participate in the discussion should emphasize the importance, on the part of the missionary or of any other occidental living and working in the Orient, of under-

standing the culture, the ideals, and the customs of the people with whom he is working.

The history of religions indicates that in the future as in the past new religions will arise and that some old as well as some new religions will disappear. It also indicates that there will be changes in the present religions. We can be sure that in the centuries to come those religions that do the most for the development of character and personality and for the betterment of mankind will, in the long run, prosper most and have the allegiance of the largest number of human beings.

The popular religion of the Chinese people, which is unorganized but which influences and permeates the other religions of China, containing as it does many superstitions and superstitious practices, has already weakened a great deal during the past century and will continue to weaken as the people of China become more and more enlightened. The religions of the non-Chinese ethnic groups of China will also change with enlightenment, and some may practically disappear. The lesser religions that have been mentioned, and other lesser religions that have not been described, will change and probably disappear. New religions may arise just as some of these lesser religions have arisen during the past decades.

As to the greater religions in China, Confucianism, Taoism, Buddhism, Mohammedanism, and Christianity, any prophecies must be made with caution and with the realization that the unexpected may happen.

CONFUCIANISM

The character and teachings of Confucius were high and noble, and the purpose of Confucius was to reform people and society so as to bring order, peace, and prosperity to the world. While Confucianism apparently degenerated because of the influence of Taoism and of the religion and customs of the common people, for many centuries it has been a benefit to the peoples of China and of other countries of Asia.

I regard as shortcomings of Confucianism the fact that in addition to the supreme being there are lesser deities; the fact that the supreme being could be worshiped only by the emperor and thus could not be approached by the common people; its low estimate of women; and the fact that the ideal age was considered to be in the past, not in

the future, so that there was less hope and expectation of progress.

Elements of strength in Confucianism are the following :

1. Its conception of a supreme god who is just, righteous, and concerned with the welfare of humanity.
2. Its emphasis on good moral conduct, obligatory for all people.
3. The teaching that people are essentially good.
4. Its near approach to the golden rule.
5. Its emphasis on the value of the family.
6. Its emphasis on education.
7. Its aim to reform and improve human society.
8. Its teaching that governments should exist for the good of the people.

Confucianism has practically ceased to function as an organized religion. It became much less influential after China changed to modern education in 1905. However, it is one of the world's great religions, with a philosophy of life and society that is optimistic, moral, and religious, and I believe that it will always be worthy of study.

TAOISM

The original philosophical Taoism has some high moral and spiritual ideals. In its conception of the Tao, there is an approach to that of a supreme god, eternal, good, spiritual, and creator of all things. In its ethical teachings there is emphasis on goodness and integrity of character and on the returning of good for evil. But throughout the centuries Taoism as a religion has changed and degenerated. Its loftiest teachings were often too abstract to be understood by common people. Practically all its priests have been ignorant magicians, playing on the superstitions of the people and exploiting their ignorance. It is very idolatrous and superstitious and has shown no ability to reform.

Elements of worth in Taoism are the high moral teachings of its founder and its original high philosophical conception of Tao, which included in its meaning that of a supreme being. Elements of weakness in Taoism are :

1. The original conception of a supreme being was not sufficiently personal.
2. The withdrawing of the founder from society instead of trying to reform it.
3. Its emphasis on inactivity and the undervaluing of human effort.
4. Its inadequate recognition of the evils of the world.
5. Its lack of a program to improve and uplift society.
6. Its idolatry, polytheism, magic and superstition, with a primary emphasis on the exorcism of demons.

By 1948 in many parts of China most of the temples, in some parts nine-tenths of them, had been destroyed or changed into buildings for schools, military barracks, hotels, apartment houses, shops, hospi-

tals, factories, etc., and the worshipers in the temples had become few. Taoism as a philosophy will always be worthy of study, but it seems very likely that as a religion it will continue to weaken and in time may completely disappear.

BUDDHISM

Buddhism, although originally a foreign religion, has long been indigenous. It is a missionary religion, and its missionaries zealously spread their religion and translated the sacred books. In due time these tasks were taken over by Chinese. At times it enjoyed the favor of emperors and other officials, and at other times it fell into disfavor and even suffered persecution. The Buddhism of China, Tibet, Korea, and Japan is the Mahayana Buddhism.

In the past many Chinese scholars have opposed Buddhism because of its otherworldliness. Other scholars were attracted to Buddhism by the facts that its sacred books were translated into elegant Chinese and that it also brought with it an intricate and somewhat satisfying philosophy. The common people were attracted to Buddhism by its compassion for human suffering, its many gods, its magic ceremonies, and by its charms and incantations to enable people to achieve desired ends. It has been influenced by Taoism and by the popular religion of China. It brought to China monasticism, image worship, karma and transmigration, a hell and a Western heaven.

There are many schools of Buddhism in China, but at least in West China these do not mean a great deal to the common people. During recent decades there have been attempts to reform the religion so as to bring it more into harmony with modern thought.

The Buddhism of today is not the Buddhism of Buddha. It rejected all the known gods of India and did not teach or worship any god or gods. Its program of salvation consisted of bringing the individual to the state of nirvana, which many interpret to be practically the extinction of personality.

Some of the shortcomings of Buddhism are:

1. Its low estimate of human life and human society.
2. Its low estimate of the family.
3. Its lack of a program to improve human beings and human society.
4. Its low estimate of women.
5. Its pessimism.
6. Its polytheism.
7. Its use of charms, incantations, and magic ceremonies.

Elements of strength in Buddhism are:

1. Its ability to adapt itself to different environments.
2. Its repudiation of caste.
3. Its strong organization.
4. Its missionary zeal and its sense of a world mission.
5. Its moral teachings, especially the first five commandments.
6. Its spirit and practice of reverent worship.
7. Its compassion for human suffering.

In China before the 20th century Buddhism appealed to the ordinary Chinese people because of its polytheism, idolatry, and the use of charms, incantations, and magical ceremonies to exorcise demons, heal diseases, and achieve desired ends. In recent decades, because of the enlightenment of the people, those features have become severe handicaps. Pilgrims to Mount Omei and worshipers in the temples dwindled to less than one-tenth, and nine-tenths of the temples, at least in Szechwan, have been torn down or, more generally, used for secular purposes. The future of Buddhism in China is at least precarious.

MOHAMMEDANISM

Estimates of the number of Mohammedans in China vary from 3 to 30 millions, and the correct number is probably between 10 and 15 millions. The increase from the beginning has been mainly by birth and by the adoption of children, sometimes purchased during times of famine, and bringing them up as Mohammedans. Mohammedanism in China has frequently laid claim to the power of exorcising demons and of working magic.

Weaknesses of Mohammedanism are:

1. The arbitrariness of God.
2. Reliance on force and military power to spread its religion.
3. Belief in fatalism.
4. The sensuous nature of heaven and hell.
5. A low estimate of women.
6. Polygamy.
7. Belief in demons and devils.
8. Repetitious prayers.
9. The imperfect moral character of its founder.

Elements of strength in Mohammedanism are:

1. Its strong belief in one god only, a supreme god.
2. Its confidence in the sovereignty of God.
3. Its belief that God is also merciful and compassionate.

4. Devotion to the will of God.
5. Belief in a final judgment that is just.
6. The habit of praying frequently.
7. Its world outlook and sense of world mission.
8. Its missionary aggressiveness.
9. The sense of unity among believers.
10. Its treatment of all races as equal, with no discrimination because of race or color.
11. Its ability to pass on the faith of fathers to their children, from generation to generation.
12. Its ability to adapt itself to different cultures.

There is no doubt that Mohammedanism is a strong religion, and will continue for centuries. Its ultimate usefulness to mankind depends upon its ability to reform and to improve.

CHRISTIANITY

We have seen that Nestorian Christianity entered China during the T'ang dynasty, and later completely disappeared. In recent centuries the Russian Orthodox Church was established in China but did not prosper greatly. Before World War II there were approximately 200,000 members of the Russian Orthodox Church in China, of which a small minority were Chinese. In 1957 there were about 40,000 members, of which about 20,000 were Chinese (China Bulletin of the Far Eastern Office, Division of Foreign Missions, NCCC/USA, November 11, 1957, p. 2). Roman Catholicism entered China much earlier than Protestantism, and in spite of opposition and persecutions spread into every province of China and into Tibet. It opened and conducted churches, schools, hospitals, and orphanages, and its primary purpose was to convert people and to teach them the Roman Catholic faith. In 1922 there were approximately 2 million Chinese communicants.

Protestant Christianity began in China in 1807 with one missionary, Robert Morrison. At first missionaries were added slowly, and Chinese converts were very few. With the opening later of treaty ports, and with the new treaties making it possible for foreign missionaries to live, travel, preach, own property, and establish churches in any part of China, the number of missions and missionaries rapidly increased. In 1948 before the iron curtain went down there were approximately 1 million Protestant communicants in China, many of whom were outstanding leaders in the church, in schools, in hospitals, and in the government.

While the Protestants were interested in making Chinese Christians

and in the developing of churches, they were also interested in improving all phases of Chinese life. Some missionaries have made important contributions by interpreting the best in Chinese culture to the rest of the world. Both missionaries and Chinese leaders have brought the best in occidental culture to the Chinese. Other contributions to the welfare of the Chinese were that the laws of health were explained in lectures, taught in schools, and spread by the publishing and distribution of literature; important textbooks were translated into Chinese; there was work for lepers; there was work for the blind and the prevention of blindness, and schools for the blind; there was work for the deaf and dumb; there were vaccination campaigns to prevent smallpox, cholera, and other diseases; there were campaigns against the planting, sale, and use of opium, the curing of opium addicts, and the spreading of information about the harm of the drug; missionaries and Chinese Christians rendered great service in famine relief; there were efforts to improve labor conditions, and there was opposition to footbinding, prostitution, sexual immorality, gambling, idolatry, polygamy, the abandonment of infants, early betrothal and marriage, having slave girls in the home, and certain phases of ancestor worship.

Practically speaking, the Protestants in China pioneered in modern medicine and medical education, and they pioneered in modern education and in the education of women and girls, laying foundations on which later the Chinese modern educational system was built and enlarged. The preaching of all Christians proclaimed high ideals of God and of human conduct, and the character and conduct of Chinese Christians averaged higher than that of other Chinese people (Lataurette, 1929, pp. 681-682).

Early in the 20th century Protestant missionaries and missions adopted the policy of developing indigenous churches with native leadership that could be self-supporting, self-governing, and self-propagating, and much progress was made toward these ends. Some of the Chinese were believed to be among the greatest Christian leaders in the world.

Beginning near the close of the 19th and continuing during the 20th century there was much progress in China toward cooperation and unity. There were union hospitals and educational institutions, and cooperation in relief and in social service. Most of the Protestant denominations cooperated through the provincial and national Christian councils, and several of the largest denominations united in the Church of Christ in China.

In my opinion there are weaknesses in the Christianity of today that hinder and lessen the value of its contribution to China and to the world. They are:

1. Overconservatism on the part of some, which prevents them from accepting much new truth that humanity has learned during recent centuries. All truth is God's truth and should be beneficial to mankind.
2. The failure of some modern-minded people to be deeply and sincerely Christian.
3. The large number of divisions or denominations. This weakens the impact of Christianity upon the world.
4. The fact that many fail to live up to the highest moral ideals and teachings of Christianity and to live in fellowship with God.
5. An overemphasis by some organizations on theology and obedience to the church instead of good moral conduct.
6. Racial prejudice and discrimination because of race or color on the part of some Christians.
7. The failure of some to follow the example and teachings of Jesus by humble service to their fellow men.

Elements of strength in Christianity are:

1. Its high conception of God as the righteous and loving father of all men.
2. The high character of its founder.
3. Its high moral teachings, including the Golden Rule, humble service to others, loving one's neighbors, loving and forgiving one's enemies, returning good for evil.
4. The high quality of its sacred book, the Bible.
5. Its high evaluation of the individual and of personality.
6. Its high esteem of women.
7. Its noble conception of life after death.
8. Its conception of the Kingdom of God as a worldwide social order in which there is justice, righteousness, kindness, and good will, and where all men are brothers and children of God.

I believe that man is by nature a religious being and needs religion, worship, and a good religious philosophy of life in order to be and to do his best in this world. I also believe that as the Chinese and all the human race become more and more enlightened, those religions that take advantage of and exploit ignorance and superstitions will gradually be abandoned, and that the religions that become the strongest will be those that contribute the most to ennoble and enrich the lives of individuals, the family, society, and the world. All religions including Christianity should reform and improve where and when possible, so that each can make its best possible contribution for the uplift of mankind.

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VOLUME 142, NUMBER 3

SOME OSTEOLOGICAL FEATURES OF
MODERN LOWER TELEOSTEAN FISHES

By

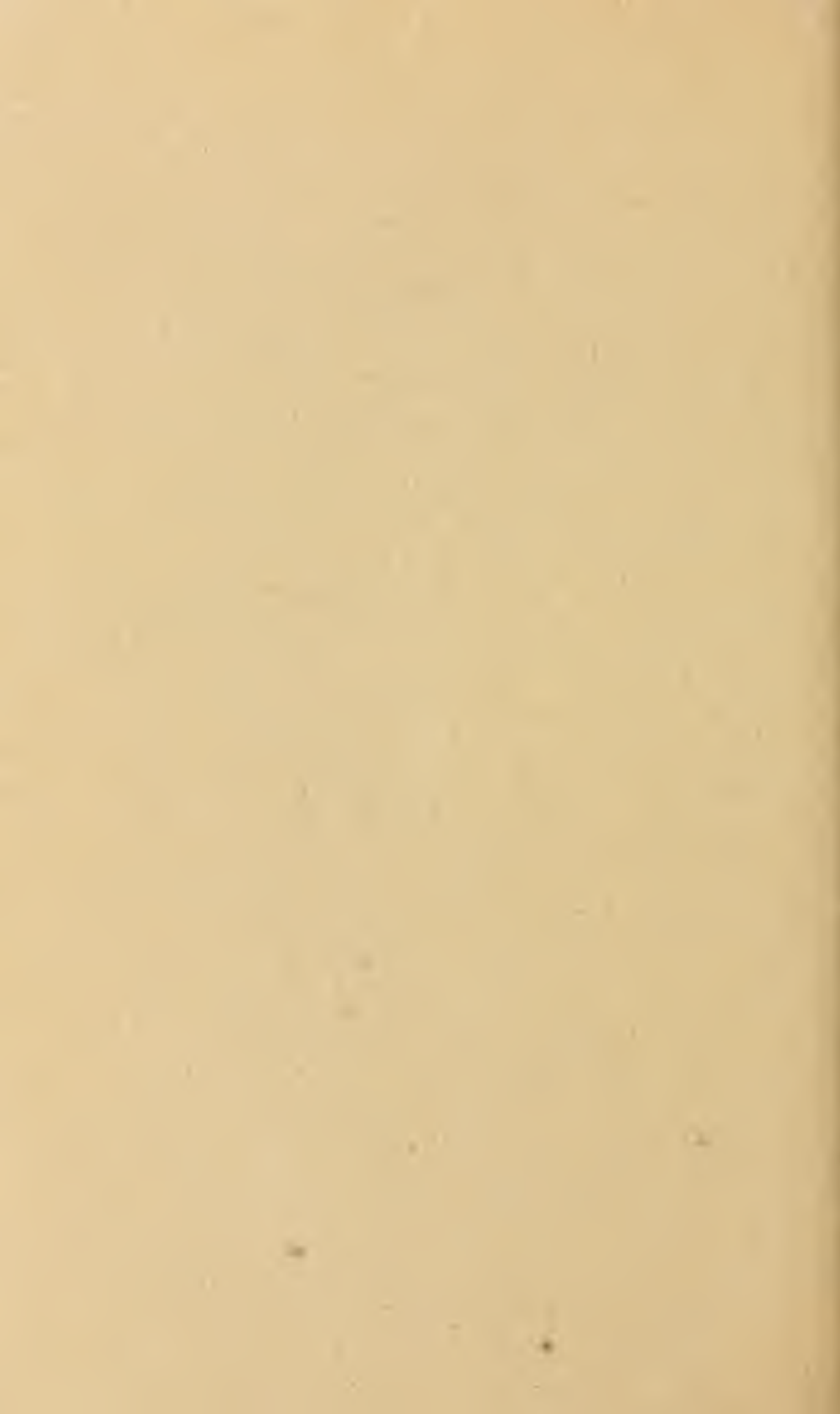
WILLIAM A. GOSLINE

Professor of Zoology, University of Hawaii



(PUBLICATION 4458)

CITY OF WASHINGTON
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INTRODUCTION

The classification of modern lower teleostean fishes has been erected piecemeal, and the interrelationships of many of the groups remain unknown. That the structure of some of these groups suggests that they are systematically quite isolated from others is hardly a sufficient excuse for neglecting the study of teleostean phylogeny.

There would seem to be several possible ways of investigating lower teleostean relationships. One is a reevaluation of existing literature on the subject, but although this has been attempted repeatedly during the last 30 years, no material advance has resulted. Apparently further knowledge of the fishes themselves is needed.

The new information that might be expected to bear most cogently on teleostean phylogeny is that to be derived from paleontology. However, for primarily technical reasons knowledge of fossil fishes is slow in forthcoming, and the nature of the fossil record is such that many crucial data will probably never be forthcoming at all. Thus a good proportion of teleostean classification will always have to depend upon such information as can be gathered from modern fishes. In any event, the ichthyologist working on existing forms can do much to point out what fishes and what structural features need particular attention if they ever are located among fossils.

In work with modern fishes there are two possible approaches to phylogenetic studies. One is the investigation of individual groups. In broad-based studies of this type, such as that of Makushok (1958) on the northern blennioid fishes, much becomes evident regarding the derivation of the group.

¹ About half of the work on the caudal skeleton reported below was done in the British Museum (Natural History). The rest of the paper was prepared in the U. S. National Museum. The author wishes to acknowledge his indebtedness to the staffs of these institutions for the facilities, and to the Guggenheim Foundation for the Fellowship, which have made this work possible.

The other approach, and the one used here, constitutes an attempt to broaden the basis for classification by the evaluation, from a phylogenetic point of view, of hitherto unused or neglected characters. Examples of this type of approach in progress are Svetovidov's studies of the fish brain, Marshall's investigation of the air bladder, and Orton's work on the possible significance of larval characters for teleostean classification. None of these studies will in themselves provide a teleostean phylogeny, but they can contribute data that will bear on such a phylogeny in two ways. First, they can suggest working hypotheses concerning relationships. Second, they can provide general background information concerning the possible usefulness of a particular structure for classification: which parts of a structure are likely to prove constant and which variable; to what extent a feature is correlated with the nature of the environment or with other characters; and what has been the general sequence of evolutionary development in the feature. Once these things are known, a structure can be added with greater confidence to the stock of data bearing on teleostean relationships.

All the structures to be dealt with in the present paper are osteological. They are (I) the caudal skeleton, (II) certain aspects of pelvic structure, (III) the superficial bones of the snout region (except the nasal), and (IV) the development of a protrusile upper jaw mechanism. All these structures are followed in greater or lesser detail from the clupeiform fishes through to the percoids. The paper concludes with a summary showing how the information presented would seem to bear on the individual lower teleostean "orders" and with a discussion of possible groupings of these "orders."

For purposes of the present exposition Berg's (1940) ordinal arrangement and nomenclature are adopted.

Certain general statements about the four structural complexes to be dealt with may be placed here advantageously. The first concerns methodology. It has been found by experience that the members within an order that have been considered "primitive" on other grounds are also usually "primitive" with regard to the four features studied here and are hence of special importance for a study of derivations. Since the objective is an understanding of ordinal relationships this paper deals primarily with these "primitive" members within orders. Conversely, specializations that appear to have taken place within an order, e.g., the protrusile jaw of the cyprinoids, are usually summarily dismissed, however interesting they may be structurally.

Second, all four features show a progressive change from the basal clupeiform fishes to the percoids. Frequently the nature of the change that occurs between the basal members of different orders is of the same type as that occurring between the more "primitive" and more "advanced" members of a single order (though this is by no means always true). Under the circumstances it seems well to point out that the successive levels of organization found in a structure can have evolved in two quite different ways (diagram 1). At the left, four

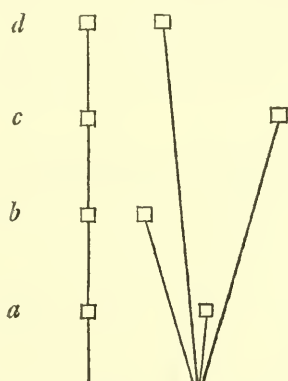


Diagram 1.

levels of structural organization are represented as having arisen through a single father-son lineage; at the right, these same levels are shown as having developed through parallel changes occurring to different degrees in different lineages. In short, similar or successive levels of structural organization in any one character may or may not be indicative of genetic relationships, depending, among other things, on whether the similarities have been developed by the means indicated at the left or at the right of the diagram.

I. THE CAUDAL SKELETON

The caudal skeleton of teleostean fishes has been the subject of a number of investigations, but no very coherent picture of the evolution of this structure in teleosts has materialized. There are a number of reasons for this, one being that the forms with a specialized caudal skeleton, e.g., the cods, have received a large proportion of the attention. The resulting impression is one of kaleidoscopic permutations brought about by losses and fusions. If, however, the basal

members of the less aberrant groups are compared, as will be done here, a more stable picture emerges.

In a previous paper (Gosline, 1960) the caudal skeletons of isospondylous fishes were discussed. There it was demonstrated that the "primitive" members, e.g., *Elops*, *Salmo*, *Hiodon*, and *Esox*, have a large number of features of caudal structure in common, and that this basic type has evolved in various ways within the order. The present paper deals with the caudal skeleton in certain of the orders usually placed between the isospondylous fishes (Clupeiformes) and the percomorph fishes (Perciformes). All the caudal structures to be discussed parallel one of three of the types developed within the isospondylous fishes. By way of background these three types will be redescribed.

Here, as in the earlier paper, the "terminal vertebra" (*TV* of figs.) is defined as the one bearing a laterally flanged lower hypural (*HY1* of figs.); this, in turn, is the lowest of the (typically) three hypurals articulating with the lower lobe of the caudal fin. In the percomorphs, as well as in most of the fishes discussed in this paper, the terminal vertebra forms the posterior end of the vertebral column, but in the lower teleosts there may be one or two separately ossified centra behind it. If so, these are called "postterminal centra" (*PT* of fig. 1). When two are present, as in the elopoid *Pterothrissus* (fig. 1A), hypurals 2 and 3 attach to the anterior (*PT1*) and one or more hypurals of the upper caudal lobe to the posterior (*PT2*).

Basically it is the varying fate of these two postterminal centra that distinguishes the three types of isospondylous skeletons. Usually these centra become incorporated in the terminal vertebrae in advanced forms, but in one group of isospondylous fishes, the osteoglossoids, a different fusion has taken place. There, a typical intervertebral articulation is retained between postterminal centra 1 and 2, and the latter seems to have fused with a large block presumably formed at least in part from the upper hypurals (fig. 1B). Later in the paper this caudal structure will be called Type III.

The other two types incorporate the two postterminal caudal centra into the terminal vertebra through different sequences of fusion. The usual method is to add the anteriormost first. At this point the three lower hypurals all attach to the terminal vertebra, leaving only a few of the upper hypurals articulating with the remaining postterminal centrum. In a second step, the second (posterior) postterminal centrum also fuses with the terminal vertebra (fig. 4A). In this line of development it is notable that the uroneural structure, even as far up

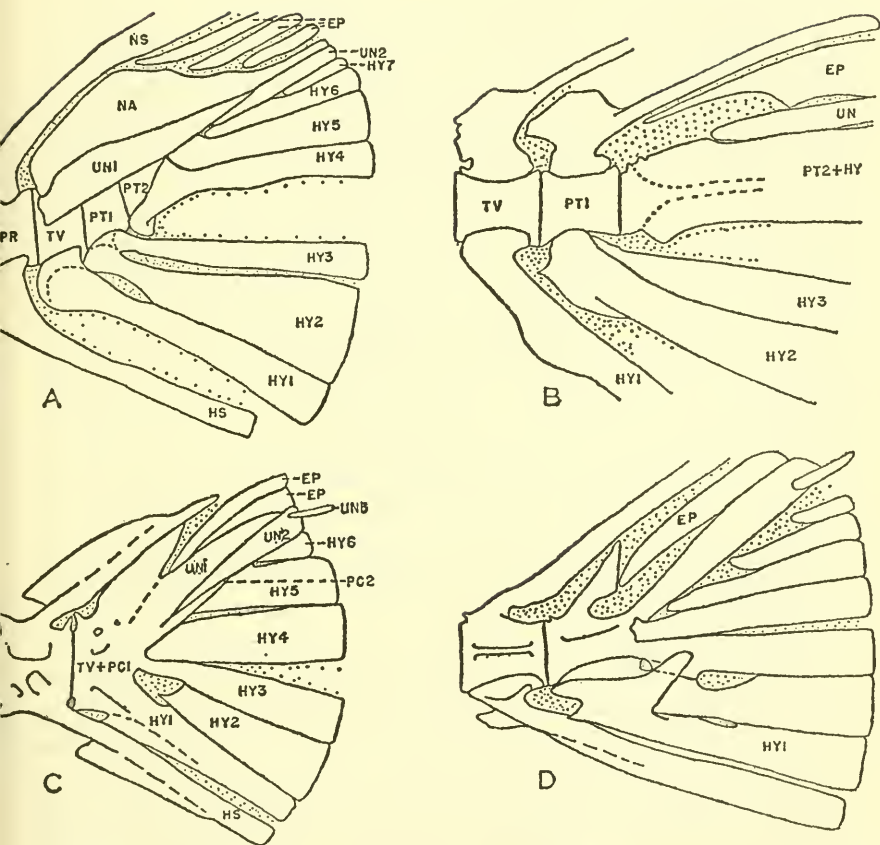


FIG. 1.—A, Caudal skeleton of *Pterothrissus gissu* (Clupeiformes). EP, epural; HS, hemal spine; HY, hypural; NA, neural arch; NS, neural spine; PR, preterminal vertebra; PT, postterminal centrum; TV, terminal vertebra; UN, uroneural.

B, Caudal skeleton of *Pantodon* sp. (Clupeiformes). Lettering as in A.

C, Caudal skeleton of *Brycon moorei* (Cypriniformes). PC, postterminal centrum. Other lettering as in A.

D, Caudal skeleton of *Chasmistes* sp. (Cypriniformes). Lettering as in A.

as the Serranidae, may retain its independent identity; consequently it is in this line, which will be called Type I, that a simple urostylar structure most frequently occurs.

A rather different course of evolution seems to have occurred in the herringlike fishes (Clupeidae, Dussumieriidae, Engraulidae), and the caudal structure of these fishes will be called Type II. Here, one or more uroneurals fuse with the terminal vertebra so that the up-turned strut, sometimes called urostyle in these fishes, is really a composite structure made up largely of the uroneurals. (This was noted long ago by Regan, 1910). Additionally, there is a difference from Type I in the way the postterminal centra become fused to the terminal vertebra. As a first step, the base of hypural 3 fuses with at least a portion of postterminal centrum 1. As a result, what appears to be the base of hypural 3 interdigitates between the terminal vertebra and the remaining (second) postterminal centrum. Also with the fusion between the base of hypural 3 and the anteriormost postterminal centrum, hypural 2 loses all basal articulation (as in fig. 1C). Later in the evolution of this lineage, postterminal centrum 2 also becomes fused with the uroneural-postterminal centrum complex (as in fig. 1C). At a final stage the uroneurals, terminal vertebra, and postterminal centra may fuse into a single structure without indication of origin (as in figs. 1D and 2A).

Though the basic purpose of this paper is to trace morphological similarities in the caudal skeleton as possible indicators of phylogenetic evolution, a secondary objective is to check certain aspects of the relationship between skeletal structure and fin form. As was noted in the earlier paper, there seems to be an indirect association between tail shape, number of caudal rays, and structure of the caudal skeleton. Since the ostariophysine fishes provide excellent material for investigating certain aspects of this relationship, they will be dealt with first.

Order Cypriniformes.—Among the ostariophysine fishes the caudal skeletons of the basal members—*Brycon* (Characidae, fig. 1C), *Chasmistes* (Catostomidae, fig. 1D), and *Diplomystes* (a catfish, fig. 2A)—show a surprising amount of general similarity. In none of the three is there a separate postterminal centrum. In all, there are the usual three lower hypurals; the terminal vertebra has a well-developed, upright neural arch; and the anterior uroneural and hypural 3 are fused with the terminal vertebra.

In most respects the caudal skeleton of *Brycon* is the most primitive of the three. Thus, in *Brycon* there are three uroneurals and a wedge,

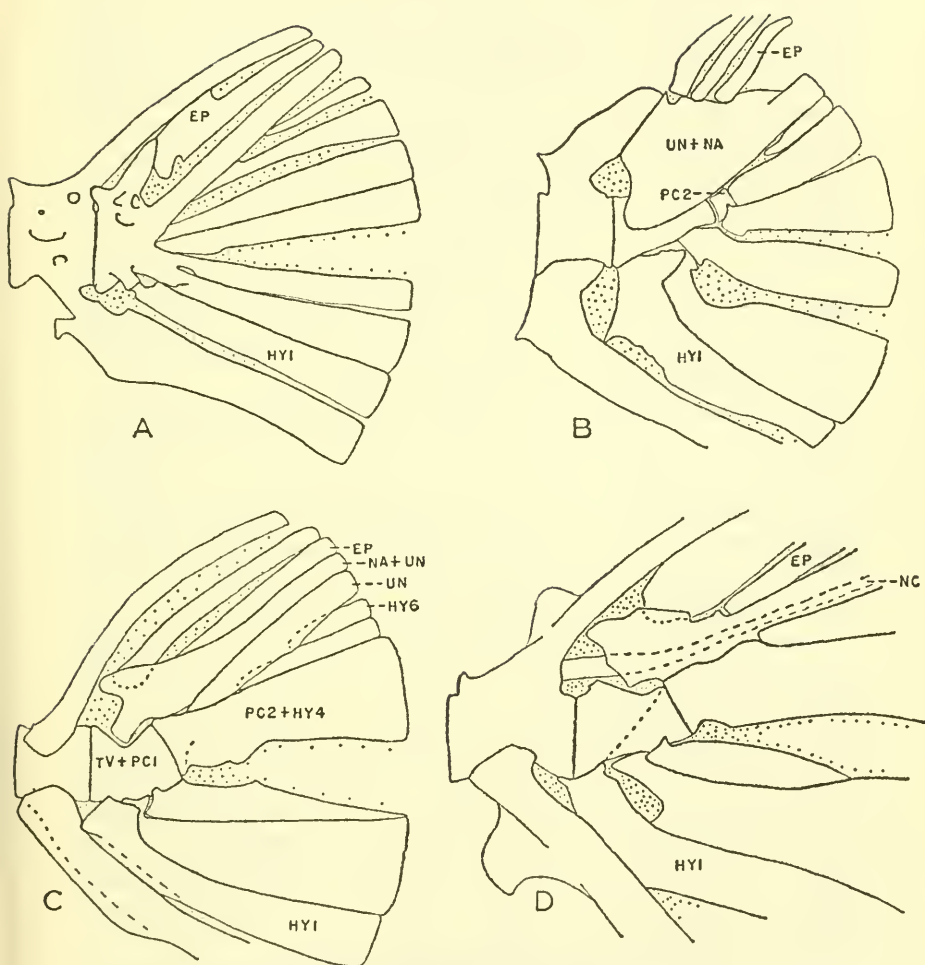


FIG. 2.—A, Caudal skeleton of *Diplomystes* sp. (Cypriniformes). Lettering as in figure 1, A.

B, Caudal skeleton of *Chlorophthalmus agassizi* (Scopeliformes). Lettering as in figure 1, A and C.

C, Caudal skeleton of *Percopsis* sp. (Percopsiformes). Lettering as in figure 1, A and C.

D, Caudal skeleton of *Aphredodorus sayanus* (Percopsiformes). NC, nerve cord. Other lettering as in figure 1, A.

undoubtedly representing one or more postterminal centra (PC_2 of fig. 1C), running up below the anterior end of uroneural 2; in the other two genera mentioned above, uroneural 2 has fused with uroneural 1 and the postterminal centra to form a single monolithic structure. In *Brycon* there are two epurals; in the others only one. In one feature, the lack of fusion between hypural 1 and the terminal vertebra, *Chasmistes* seems to represent the primitive condition.

With regard to variations other than those mentioned, hypural 2 seems to show the greatest plasticity. In *Brycon moorei* (fig. 1C) hypural 2 is separate from the hypurals above and below, but in a U. S. National Museum skeleton of *Brycon oligolepis*, hypural 2 fuses basally with hypural 3 for a short distance and distally with hypural 1. In *Chasmistes* there is a basal fusion between hypurals 1 and 2, and in *Diplomystes* between hypurals 2 and 3.

As to possible relationships of the order, the caudal skeleton of *Brycon* bears a striking resemblance to that of the round herring, *Dussumieria* (Gosline, 1960, fig. 7). The upright neural arch of the terminal vertebra of *Brycon*, *Chasmistes*, and *Diplomystes* is a notable feature of the Clupeoidae in general. The fusion of hypural 3 with the terminal vertebra is found again in *Dussumieria* as is the *Brycon* characteristic of a wedgelike strut running below uroneural 2.

From the basal types of ostariophysine caudal skeletons described above, the various lineages have evolved different peculiarities. Two of the more specialized types of catfish caudal skeletons have been illustrated by Whitehouse (1910, pl. 47, figs. 7, 8). The characins have presumably given rise to the gymnotid eels, many of which have a tail tapering to a fine filament; in these, at least, the caudal skeleton has been lost entirely. In the cyprinoids, by contrast, the caudal skeletons seem to remain relatively constant: those of the catostomids, cyprinids, and even of the round-tailed cobitid *Misgurnus anguillicaudatus*, differ only in minor detail.

In view of this cyprinoid constancy of skeletal structure, the variation in caudal ray count comes as something of a surprise. In all the members of the Cyprinidae examined—*Hypophthalmichthys*, *Garra*, *Gobiobotia*, *Saurogobio*, *Hemibarbus*, and numerous American forms (but not *Moapa* and *Eremichthys*, which were unavailable)—the branched caudal rays are constantly 17. On the other hand, most of the cyprinoids examined except the Cyprinidae have fewer than 17 branched rays (*Psilorhynchus* was unavailable). In numerous catostomids examined (including *Myxocyprinus* of China) the branched caudal ray count is constantly 16. Among old world relatives of the

family Cyprinidae, the caudal count is more variable and may best be shown in tabular form (table 1).

Only one aspect of the data in table 1 will be discussed here. All the fishes listed except *Cobitis* and *Misgurnus* have a caudal outline that varies from emarginate to deeply forked. It is, then, the round-

TABLE 1.—*Branched caudal rays in certain cyprinoid fishes*

Species	Number of branched rays						Region	USNM No.
	12	13	14	15	16	17		
Catostomidae					x ¹			
Cyprinidae						x ²		
Homalopteridae								
<i>Bhavana australis</i>					2		India	165107
<i>Balitoria brucei</i>					3		Burma	44808
<i>Hemimyzon formosanus</i>					1	4	Formosa	161711
Gyrinocheilidae								
<i>Gyrinocheilus aymonieri</i>					8		China	117718
Cobitidae								
Cobitinae								
<i>Cobitis taenia</i>		1	4				Turkey	143864
<i>Misgurnus anguillicaudatus</i> ..	1	8	23	3	1		China	85944, 130354
<i>Acanthophthalmus kuhlii</i>			4				Aquarium specimens	
Botiinae								
<i>Botia</i> sp.					9		China	89178, 89179
Nemachilinae								
<i>Nemachilus (Barbatula)</i> sp...					9		China	91713
Gastromyzonidae								
Crossostominae								
<i>Glaniopsis hanitschi</i>					2		Borneo	113325
Gastromyzoninae								
<i>Beaufortia pingi</i>				6			China	117718
<i>Gastromyzon borneensis</i>					6		Borneo	113324

¹ All catostomids examined had 16 branched caudal rays; see text.

² All cyprinids examined had 17 branched caudal rays; see text.

tailed members of the cyprinoid group that have the lowest (and also apparently the most variable) number of caudal rays. (Some attempt was made to determine whether the number of forked caudal rays in *Misgurnus* varied with size, but no such ontogenetic change was found in specimens between 41 and 150 mm. in standard length.)

The question remains as to why the caudal count should vary in the fork-tailed cyprinoids. An attempt was made to get at this problem by comparing the cyprinids (17 branched rays) with the catostomids

(16 branched rays). Preliminary analysis showed that the difference in ray count occurs in the upper caudal lobe (9 branched rays in cyprinids, 8 in suckers). To pinpoint the position of the lost ray an effort was made to relate the rays to the hypural on which they originate. Here the complication was promptly encountered that in both cyprinids and suckers the number of hypurals extending to the upper caudal lobe varies between 3 and 4. In the catostomids examined, almost all had 4 upper hypurals, though the uppermost (fig. 1D) is sometimes quite small; the only exception was in *Erimyzon sucetta*, where, in three specimens examined, the uppermost hypural was missing completely. In the Cyprinidae, on the other hand, the majority of forms examined had only 3 upper hypurals, but *Carassius auratus* (two specimens), *Semotilus corporalis* (two specimens), and *Campostoma anomalum* (one specimen) had 4. Though the number of 3 or 4 seemed to be constant within species in the available material, no relationship between hypural number and the systematic position of the species could be discerned. When an attempt was made to relate certain caudal ray bases with specific hypurals, it was discovered that the number of ray bases articulating with any one hypural varied by plus or minus 2 (compare Makushok, 1958, p. 11), even when members of the same family with the same number of hypurals were compared. Furthermore, it was found that some of the ray bases extended over parts of two hypurals. From all this it was concluded that there is no close correlation between the caudal ray bases and the hypurals in cyprinoid fishes. It was also concluded that for systematic purposes in cyprinoids a difference of one hypural has less significance than the difference of one branched ray. However, the mystery of the disappearing ray in the upper caudal lobe of catostomids remains unsolved.

Order Scopeliformes.—Among the iniiomous fishes caudal skeletons of the genera *Aulopus*, *Synodus*, *Chlorophthalmus*, *Solivomer*, *Lampanyctus*, *Omosudis*, *Lestidium*, and *Alepisaurus* have been examined.

Aulopus differs immediately from all the others in the retention of bony fulcral scales in front of the accessory caudal rays above and below. As to the caudal skeleton itself, the basic features of caudal structure shown for *Chlorophthalmus* (fig. 2B) are found throughout these genera. The terminal vertebra and postterminal centrum 1 have fused into an elongate structure; a separate postterminal centrum 2 is frequently visible in lateral view; the anterior uroneurals have a high median crest (probably a neural arch structure) but are never fused with the centra below (except perhaps in *Lampanyctus*).

One of the most frequent variations and one that is apparently of little systematic significance is the loss of postterminal centrum 2; this occurs in the adult *Synodus*, in *Lampanyctus*, *Omosudis*, *Lestidium*, and *Alepisaurus*. The loss of this structure in alepisauroids is probably correlated with the rather sharp upturning of the last vertebra as compared with myctophoids. There is also a repeated fusion of hypurals, particularly the three lowermost. The three epurals seem more constant; they are reduced to 1 or 2 only in the synodontids among the material examined. The synodontids also are unique in that the anterior uroneurals are broken up into a number of platelets in the adult (Hollister, 1937b).

Order Anguilliformes.—The caudal skeletons of five eels belonging to three families are illustrated by Whitehouse (1910, pl. 48, figs. 9-13). Though these are obviously specialized, it is tempting to identify the lower, double hypural as the fusion of the hypurals usually numbered 2 and 3. If this is correct, then these eels have one complete postterminal centrum, plus a second fused with the posteriormost hypural plate. The elements labeled n. a. (equals neural arch) in Whitehouse's plate would appear to be uroneurals. Under the explanation offered here, the eel caudal skeleton is merely a specialized offshoot of a basically primitive type.

Miscellaneous orders.—The halosauroids and notacanthoids all have a long, tapering tail with little or no possibility of a caudal skeleton. The same is true of the macruroids. The caudal skeleton of the cods has received a considerable amount of attention (e.g., Barrington, 1937). However, it seems to be far more aberrant than even that of the eels, and its parts cannot easily be homologized with those of any of the fishes dealt with here.

In the Beloniformes, Syngnathiformes (c.f., Whitehouse, 1910, pl. 48, fig. 15), and Gasterosteiformes the caudal skeletons consist of platelike hypurals that obviously represent secondary simplification, leaving little trace of their derivation. They cannot profitably be discussed here.

No caudal skeletons of the Phallostethiformes have been available.

Order Percopsiformes.—The caudal skeleton of "*Columbia*" has been figured by Regan (1911b, p. 295, fig. B); those of *Percopsis* and *Aphredodorus* are illustrated here (figs. 2C and D). In a number of features all are peculiar. The terminal vertebra and 1st postterminal centrum have fused, but in *Percopsis* (fig. 2C) there is a sharp upward bend in this combined element, and in *Aphredodorus* (fig. 2D) it has a peculiar diagonal line which seems to represent either an oddly

oriented line of fusion or a line of shearing stress between the parts. In both genera postterminal centrum 2 seems to have fused with one or more of the upper hypurals. In *Aphredodorus*, hypurals 2 and 3 are closely associated and hypural 1 has its articular base in part over the preterminal vertebra.

Order Cyprinodontiformes.—As with so many other round-tailed fishes, considerable difficulty has been encountered in interpreting the caudal structure of the Cyprinodontiformes. Also as in other round-tailed groups, the number of branched caudal rays varies greatly. For example, there were 9 branched caudal rays in three specimens of *Chologaster* examined, 13 in a specimen of *Fundulus*, and 17 in a *Belonesox*.

The caudal skeletons of *Amblyopsis* (fig. 3A) and *Chologaster* (fig. 3B) are presumably more "primitive" than those of other members of the order. In these two genera the tip of the vertebral column (presumably represented by PC2) fuses with the upper hypural plate. The lower half of the hypural fan seems best interpreted by comparison with the caudal skeleton of *Aphredodorus* (fig. 2D). If the *Aphredodorus* caudal structure really represents a generalized form of that seen in *Amblyopsis* and *Chologaster*, then hypurals 2 and 3 have fused, and hypural 1 has lost all basal attachment. (Seemingly hypural 1 frequently does this in round-tailed fishes, judging by the illustrations in Whitehouse, 1910, and others.)

The caudal skeletons of various nonamblyopoid cyprinodonts have been illustrated by Hollister (1940). Part of that of *Fundulus* is shown here (fig. 3C). The simplest explanation for *Fundulus* is that the terminal vertebra, postterminal centra, and all the hypurals have fused into a single plate. If this is correct, the intervertebral articulation between the postterminal centra 1 and 2 has been lost in *Fundulus*, leaving it with one fewer vertebra at the base of the caudal fin than *Amblyopsis* and *Chologaster*. However, no sign of the lost intervertebral articulation could be seen in the stained specimen of *Fundulus* examined, or in the juvenile specimens of *Mollienisia* illustrated by Hollister (1940, figs. 7-10).

Order Lampridiformes.—The only caudal skeleton of a member of this order available was one of *Velifer* (fig. 3D). Once again there is the intervertebral type of articulation between postterminal centrum (1?) and the structure behind it (a postterminal centrum fused with a hypural?). This feature sets *Velifer* to one side of the lineage leading to the percoids, as far as caudal skeleton is concerned. The slight resemblance to *Amblyopsis* and *Aphredodorus* seems of highly dubious significance.

Orders Beryciformes, Zeiformes, and Perciformes.—As far as basic pattern of the caudal skeleton is concerned, these three orders may be grouped together. There seems no reason why one should not have been derived from the basic stock of another or, alternatively, why all three should not have developed from a single basal stock. The most significant difference, perhaps, is the number of caudal

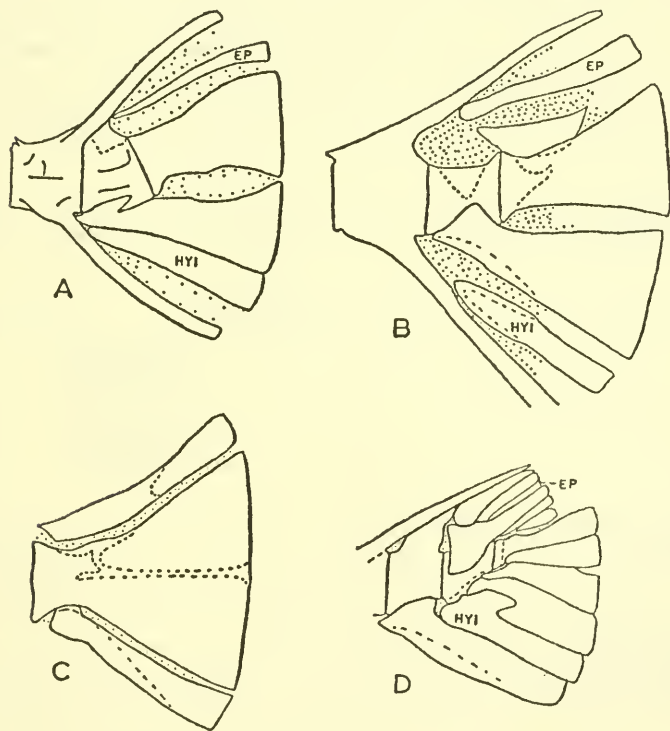


FIG. 3.—A, Caudal skeleton of *Amblyopsis spelaesus* (Cyprinodontiformes). Lettering as in figure 1, A.

B, Caudal skeleton of *Chologaster* sp. (Cyprinodontiformes). Lettering as in figure 1, A.

C, Part of caudal skeleton of *Fundulus olivaceus* (Cyprinodontiformes).

D, Caudal skeleton of *Velifer hypsiopterus* (Lampridiformes). Lettering as in figure 1, A.

rays; in the Beryciformes this is said to be 17 branched (except for 16 in the Polymixiidae), in the Zeiformes 10 to 13, and in the Perciformes basically 15 branched. In each of the three orders there is a gradation in the caudal skeleton from forms in which this structure is fairly primitive or generalized to forms in which it is considerably fused.

Among the Beryciformes the two apparently extreme types of caudal skeleton have been well illustrated. In *Polymixia* (Regan, 1911a, fig. 1) the first preterminal vertebra has a normal spine but no neural crest, the anterior uroneural is wedged into the terminal vertebra, and there is one postterminal centrum. In *Hoplopteryx* (Regan, 1911a, fig. 2) the first preterminal vertebra has a crest but no neural spine, the anterior uroneural is fused with the terminal vertebra, and there are no postterminal centra. *Polymixia* is the more primitive of the two in all of the features mentioned. An examination of the caudal skeletons of *Hoplostethus*, *Myripristis*, and *Holocentrus* indicates that various combinations of the *Polymixia*-*Hoplopteryx* types occur among berycoids (diagram 2). Thus *Hoplostethus*

Preterminal vertebra with a normal neural spine but no median crest	Preterminal vertebra with a median crest but no neural spine
	<i>Holocentrus</i> (Holocentridae)
	<i>Myripristis</i> (Holocentridae)
	<i>Hoplopteryx</i> (Berycidae)
Anterior uroneural fused with terminal vertebra No postterminal centrum in adult	
Anterior uroneural wedged into terminal vertebra A separate postterminal centrum	
<i>Polymixia</i> (Polymixiidae)	<i>Hoplostethus</i> (Trachichthyidae)

Diagram 2.

thus has the postterminal centrum and free uroneural of *Polymixia* but the neural crest on the preterminal vertebra as in *Hoplopteryx*. In *Holocentrus* the bone fusions are as in *Hoplopteryx* and there is the neural crest on the preterminal vertebra as in *Hoplopteryx*, but the first epural is so oriented as to give the distinct impression that it has arisen from the neural spine of the preterminal vertebra.

Among the Zeiformes the caudal skeleton of *Antigonia* (fig. 4A) has the same basic structure as that of the percoid *Serranus*. In both,

the postterminal centra have fused with the terminal vertebra to form a tapering point (urostyle) on the latter; there is only a single uroneural (which is not fused to the terminal vertebra); there are 3 epurals and 6 hypurals; and the first preterminal vertebra bears a neural crest but no neural spine.

In contrast to *Antigonia*, the caudal skeleton of *Zeus* (cf., Norman, 1934, p. 6, fig. 6D) has undergone so much fusion that its component parts are identifiable only with difficulty.

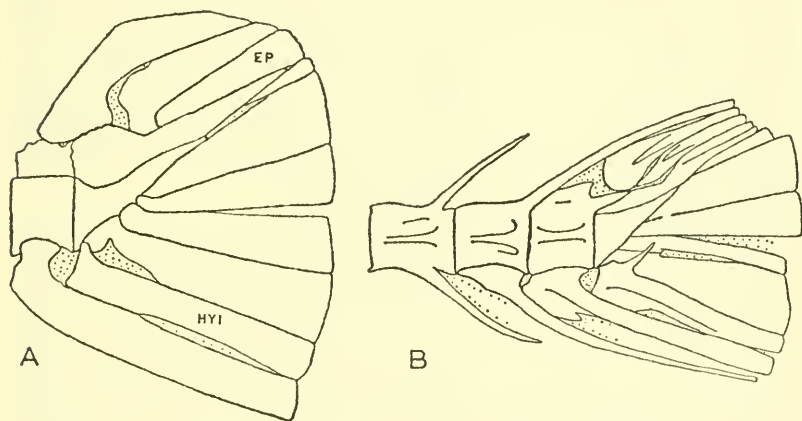


FIG. 4.—A, Caudal skeleton of *Antigonia capros* (Zeiformes). Lettering as in figure 1, A.

B, Caudal skeleton of *Epinephelus bonaci* (Perciformes).

With regard to the Perciformes, the only point that will be made here has to do with two presumably derivative groups, namely, the Mugiloidei (Percesoces) and the Pleuronectiformes (Heterosomata). In both of these (cf., Hollister, 1937a, and Norman, 1934, p. 3, fig. 3, respectively) the caudal skeleton shows considerably more fusion than in the basal percoids (fig. 4B).

Discussion.—Three matters will be taken up here: the sequence in the fusion of parts of the caudal skeleton; the similarities in structure shown by the basal members of various groups; and finally the evolutionary changes that have occurred in the caudal skeleton within groups.

At the different levels of organization between the isospondylous fishes and the percoids there has been a progressive reduction in the number of parts. Some of this has doubtless come about through loss, but perhaps a greater portion has been the result of fusion. The ex-

tent to which fusion has occurred differs within and between the various groups of fishes. This secondary simplification of structure has been evolved through a number of steps, and the sequence of these steps seems to have been essentially the same in various groups of fishes. Thus, hypurals 2 and 3 seem to fuse before hypural 1 becomes added to the group, e.g., in cyprinodonts and apparently in eels; post-terminal centrum 1 becomes amalgamated with the terminal vertebra, with postterminal centrum 2 coming in in the more advanced forms; etc. When these sequences are changed, other features of the caudal skeleton seem to evolve in other than the usual fashion, or vice versa. In any event the different sequences form the bases upon which the three caudal skeleton types designated here have been established. It may be added that the end point in the evolution of all three would be a simple platelike caudal skeleton which would be essentially the same regardless of what sequence had been followed. Such an end point is represented by *Fundulus* (fig. 3C).

In a very general way there is an association between fusion of parts in the caudal skeleton and reduction in the number of caudal rays. Perhaps no significance should be read into this other than as independent exemplifications of the trend in the evolution of teleostean fishes toward the reduction of the number of parts throughout the head and body. Certainly in the example of the cyprinoids dealt with above there was no relationship between the number of caudal rays and of hypurals.

There seems to be equally little direct relationship between the amount of fusion and fin type or mode of life. There are numerous round-tailed fishes with a fused, platelike caudal skeleton (*Fundulus*) and fork-tailed forms with similar features (Beloniformes); similarly there are slow- and weak-moving forms (pipefishes) and fast-swimming fishes (tunas) with platelike caudal skeletons. The epitome of consolidation is undoubtedly reached in the small, neotenic *Schindleria* (Gosline, 1959, p. 75).

Turning to the three basal types of caudal structure distinguished in the introduction to this section, Type I is by far the commonest. It occurs among all iniomous and in the basal berycoid, zeoid, and perciform fishes. In these the uroneural(s) do not fuse with the vertebral elements and a separate second postterminal centrum is usually visible, though postterminal centrum 1 has fused with the terminal vertebra. This type is also well represented among isospondylous fishes, e.g., salmonoids and stomiatoids. Indeed Type I seems to be a stage in the normal or at least usual route of evolution followed in the modern teleosts.

Types II and III, by contrast, appear to represent divergent evolu-

tionary side lines. It thus seems more probable that the representatives of these types are either phylogenetically related or have evolved their caudal similarities as the results of rather unusual environmental stresses (or both). The (Type II) resemblances between the round herrings and the characin *Brycon* are particularly intriguing in this regard, for the similarities extend to trivialities.

As to Type III, it is difficult to understand why postterminal vertebra 2 should have fused with upper hypurals in such divergent fishes as osteoglossoids, the Percopsiformes, cyprinodonts, *Velifer*, and apparently in eels. Perhaps the best explanation that can be offered is that suggested in a previous paper (Gosline, 1960), namely, that these forms have all had round-tailed ancestral forms, even if they have a forked tail now. Of these groups the caudal skeletons of only *Aphredodorus* and *Amblyopsis* show sufficient similarity in detail to suggest an inquiry into the possibility of phylogenetic relationship.

In the introduction to the paper the within-group evolution of the structures dealt with was noted. Since the caudal skeleton shows this feature the most strikingly of the four characters examined, the subject will be discussed here.

Our present classification of teleostean fishes has been erected chiefly through efforts to distinguish groups, and for purposes of presentation the "orders" are frequently represented as a series of beads attached to one another by longer or shorter strings. As a result, the fact that evolution has occurred within orders has become obscured.

Now it is very possible that the major teleostean orders originally did evolve in response to a particular mode of life (Simpson, 1944), and that if only the characters involved in these adaptations are considered, the orders could be represented as a series of rather separate beads. Nevertheless, such characters would only represent a very small proportion of those found in the fish as a whole. For all other features progressive change would either not occur or might be expected as much within as between orders. As far as the caudal skeleton is concerned, the amount of change that takes place within the ostariophysine fishes and other orders is far greater than the difference between *Albula* and *Epinephelus*. Or, to put the matter differently, the caudal skeletons of the basal berycoids and serranids are nearer the basal clupeiform type than that of *Clupea*.

II. SOME FEATURES OF PELVIC STRUCTURE

The position of the pelvic fin and the number of its rays are almost universally used in the higher classification of teleostean fishes. In-

ternal pelvic structures have been neglected. The most thorough account of pelvic anatomy in fishes is that of Sewertzoff (1934); within groups, Sheldon's (1937) treatment of the pelvic girdle in catfishes appears to be unique. The facets of pelvic structure that will be treated here are the small, curved splint of bone that lies outside of the outermost ray in many lower teleosts, and the radial elements.

The pelvic fins of most lower teleosts are made up of a series of segmented soft rays (lepidotrichia of Goodrich, 1904, Jarvik, 1959, and others), each of which contains a separate upper and lower half. The only exception is the curved splint that runs for most of its length along the outer surface of the upper half of the outermost ray on either side (fig. 5A to C). This splint never shows any transverse

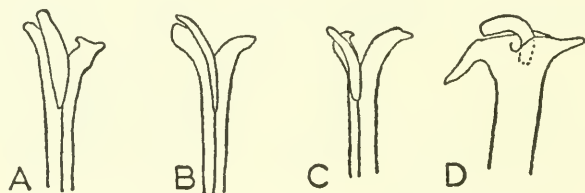


FIG. 5.—Outermost right pelvic ray bases, lateral views.

A, *Tarpon* (Clupeiformes); B, *Solivomer* (Scopeliformes); C, *Aphredodorus* (Percopsiformes); D, *Myripristis* (Beryciformes).

segmentation, and its anterior end does not articulate with the pelvic girdle but lies free in the skin. The origin and nature of this structure seem to be unknown. Suffice it to say here that it can be traced back in typical form and condition to *Amia*. In *Lepisosteus* there is a minute, unpaired, diamond-shaped plate on the outside of the base of the lateralmost ray, but whether this is the same element as the curved strut of *Amia* seems open to question.

Among the Clupeiformes this curved splint is present in *Tarpon* (fig. 5A), *Pterothrissus*, *Salmo*, and *Chanos* among the forms examined. In the Dussumieriidae, Clupeidae, and Engraulidae it appears to be missing, at least as a separate element.

There is probably no great systematic significance to be attached to the loss of this splint. Thus, among the haplous fishes it is present in *Esox* but apparently not in *Umbra*. Among the inious fishes it occurs in *Solivomer* (fig. 5B) but not in *Aulopus*. Among ostariophysine fishes it appears in *Brycon*, and among the cyprinodonts, in a specimen of *Fundulus majalis* (but not in another form of *Fundulus* examined). About all that can be said is that, like the orbitosphenoid,

it represents, when present, the holdover of a primitive teleostean (holostean?) feature.

Under the circumstances it only remains to point out the high degree of development of this splint in two lower teleostean groups—the Notacanthiformes and Percopsiformes. Among the soft-rayed halosauriform fishes as represented by *Halosauropsis*, this outer splint is present in fairly typical elopoid form. In the spinous *Notacanthus*, however, this same structure has been transformed into one of the several pungent spines at the outside of each pelvic fin. The other spines, as indicated by their forked bases, have formed by the fusion of two halves of a segmented ray. (In this they are similar in construction to the single pelvic spine of the berycoids and percoids.)

In the Percopsiformes (fig. 5C) the outermost ray structure of the pelvic fin is about as in the elopoids. This, like so many other features, indicates the low level of organization of the group.

At this point the question may well be asked: What is a pelvic spine? If *Percopsis* has a pelvic spine, then so have *Tarpon*, *Salmo*, and others. If the outer splintlike structure should not be considered a spine, then in counting the pelvic spines of *Notacanthus* should one count the number of pungent elements and subtract one? The difficulty cannot satisfactorily be resolved by fiat, but in practice the systematist can easily handle the problem by stating how he is making his pelvic fin counts. As a guide in this matter it may be said that, with the exception of the notacanthids, the author has never found a separate splint developed in those forms that have a true pelvic spine, e.g., holocentrids and percoids.

In living holosteans and in many lower teleosts there are either three or four radials between the pelvic rays and the pelvic girdle on each side (Sewertzoff, 1934). In *Lepisosteus*, *Amia*, and most isospondylous fishes (fig. 6A) the innermost radial (the metapterygium according to Sewertzoff) is enlarged and runs partly under and partly along the inside of the innermost ray. Lateral to this innermost radial there are either two or three smaller nodules of bone that are more or less hidden between the two halves of the ray bases. These nodules may be, and perhaps always are, enclosed in cartilage.

To summarize concerning these radial elements as a group, the author has found them well developed in isospondylous fishes, in *Aulopus* among iniomous fishes, and in *Holocentrus* among the berycoids. However, a number of lower (and apparently all higher) teleosts lack separate radial ossifications. Indeed, even among the haplomous fishes the pelvic rays seem to articulate, at least in part, with a cartilaginous area that contains no radial ossifications.

The interest here is not so much in the presence or absence of independent radial elements as in the history of two of these, the innermost and outermost, in certain lower teleostean groups. Among the isospondylous fishes the inner radial may be large (as in *Salmo*, fig. 6A, and *Tarpon*), small (as in *Hiodon* and *Yarrella*), or apparently absent (as in *Esox* and *Umbra*). However, in all the isospondylous fishes examined it is either absent or has a movable articulation with the base of the innermost ray.

In apparently the great majority of iniomous fishes, by contrast, this inner radial becomes fused to the lower half of the innermost

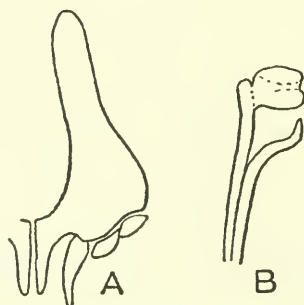


FIG. 6.—A, Pelvic girdle of larval salmon (*Clupeiformes*). (From Sewertsoff, 1934, fig. 26.)

B, Innermost right pelvic ray of *Myripristis* (*Beryciformes*). The front of the fish is toward the top, and the bottom of the fish is to the left of the figure.

pelvic ray (Gosline, in press). As a result of this, the two or three rays lateral to the innermost ray appear to articulate with a club-shaped basal extension (as in fig. 6B) of the inner ray. As has been pointed out (Gosline, in press), this fusion of radial and ray is not invariable in the iniomous fishes. The known exceptions occur in *Alepisaurus* where the inner pelvic ray and radial are attached but not fused to one another, and in *Bathypterois* where the two structural elements movably articulate with one another as in most isospondylous fishes.

In both *Halosauropsis* and *Notacanthus* of the *Notacanthiformes* the innermost ray of the pelvic fin articulates movably with the inner radial as in isospondylous fishes. The same condition holds for *Brycon* among the ostariophysine fishes.

By contrast there are several orders in which the bottom half of the innermost pelvic ray has the club-shaped (radial) extension typical of the iniomous fishes. Among these are at least the *Percopsi-*

formes (*Aphredodorus* and *Percopsis* examined), the Beryciformes (*Holocentrus* examined) and the Beloniformes (*Chriodorus* and *Athlennes* examined).

In view of the variability of the radials and the paucity of the material studied it seems inadvisable to push too far the inference that can be drawn from the inner radial regarding genetic relationships. Suffice it then to summarize by suggesting that the Notacanthiformes and Cypriniformes seem to show an isospondylous type of inner radial organization, and the Percopsiformes, Beryciformes, and Beloniformes, an inious type.

The history of the outermost radial may be dealt with even more briefly. In a fish like *Salmo* (fig. 6A) or *Synodus*, this radial is a flattish, pebblelike nodule lying between the bases of the halves of the three outermost pelvic rays. In the beloniform *Athlennes* and the syngnathiform *Fistularia* the author has been unable to find any independent radial ossifications. In the beryciform genera *Holocentrus* and *Myripristis* the outer soft ray has been transformed into a rather formidable spine. This spine has a complicated articulation with the pelvic girdle which effectively restricts movement to one plane. (The same thing is true of the holocentrid dorsal spines, which seem to have essentially the same system of basal articulation.) In *Holocentrus* and *Myripristis* there is a small, movable nodule of bone (fig. 5D), flattish except for a curved projection that penetrates a hole in the base of the pelvic spine, that presumably represents the outer radial. In the zeiform genus *Antigonia* and several percoids examined there is no trace of a separate ossification between the base of the pelvic spine and the girdle.

Concerning the pelvic spines formed from soft rays (and not from the outer, curved splint discussed earlier), it has already been noted that there are several of these in notacanthids. Aside from this group, a true pelvic spine seems to occur first in the berycoids and zeoids. At least, the outer rays of the gadid *Lota*, the lampridiform *Velifer*, and others all proved to be of the divided and segmented type (lepidotrichia) found in lower forms. There is, however, no guarantee that a fish with an outer soft pelvic ray has not merely lost the spine as has indeed happened in the majority of the flatfishes (Norman, 1934; Hubbs, 1945).

III. SOME BONES OF THE SNOOT REGION IN MODERN TELEOSTEAN FISHES

The bones discussed in the present section are the supraorbital and certain of the ossifications surrounding the sensory canals of the

snout. The evolution of these bones is closely associated with the functions they serve. Originally this function was that of protecting the lateral line canals of the surface of the snout. However, in many lower teleosts three of these bones—the supraorbital, antorbital, and lacrimal—have developed into a system for pumping water in and out of the olfactory capsule. Some aspects of the sensory canal system and its ossicles in certain lower teleosts will be described first. The remainder of the section will be devoted to the pumping system and its ossifications.

Transverse sensory canals of the snout region in certain lower teleosts.—The ethmoidal commissure of the sensory canal system has a rather brief history in modern teleosts. Presumably, like the supratemporal commissure, it was originally enclosed in a series of separate, flat, roofing bones, as in *Amia*.

Among the teleosts the ethmoidal commissure most closely approaches the *Amia* condition in *Elops* (Nybelin, 1957). Here the median portion of the canal passes through a bone called the rostral by Nybelin (1957, p. 456, fig. 2), but more generally termed the mesethmoid (cf., Starks, 1926, p. 143); in any event all traces of independent, superficial, canal-bearing plates have disappeared. Laterally on each side, the commissure just misses the front of the supraorbital canal and then passes back through two lateral rostral plates to join the infraorbital canal at the front of the lacrimal.

In a young specimen of *Megalops* examined, as in *Tarpon* (Nybelin, 1957, p. 457), there is also a well-developed ethmoidal commissure. But unlike *Elops*, that of *Megalops* fails to connect laterally with the infraorbital canal. Furthermore, there is only one lateral rostral on each side instead of two. Presumably, the posterior lateral rostral with its canal has dropped out, eliminating the junction between the commissure and the infraorbital system.

My efforts to find, by gross dissection, either a bone-enclosed ethmoidal commissure or lateral rostral ossicles in alepocephalids, clupeids, and round herrings have been unsuccessful. Presumably the ethmoidal commissure described for *Clupea* by Wohlfahrt (1937) passes entirely through the flesh of the snout. (The sensory canals of the head in teleosts are by no means always bone enclosed, cf., Gosline, 1949, p. 3.)

The ethmoidal commissures described to this point are easily recognized as such. However, certain other lower teleosts have transverse canals in the snout region so peculiar as to arouse doubt whether or not they are commissure derivatives. One such series has been de-

scribed in the eels by Allis (1903); this will not be discussed here. Very different canal structures occur in the snouts of the albulids and halosaurids. These will be described below.

At least some of the difficulties with the canal bones of the head in *Albula* and *Pterothrissus* undoubtedly arise in relation to the cavernous trough system of lateral line canals in these fishes. Many deep-water fishes, but also some shallow-water and even some fresh-water forms, have such a system of troughs replacing the usual sensory canals of the head. Such troughs differ from the usual tubes in a number of ways. In the first place the external surface of these troughs is covered by a layer of thin, taut skin. In the second, such a system may have a large number of minute openings to the exterior, but it lacks the usual type of large (primary) sensory canal pores. Whatever the significance of these differences as far as function is concerned, it seems certain that a trough system shows considerable variation as compared to the relatively stable normal canals. Connections may be established between some parts of a cavernous system and membranous closures may be developed between others. Sometimes, e.g., in *Halosauropsis*, there seems to be a separate ossicle developed below each lateral line sense organ (neuromast). With this background, which is based on an examination of such diverse fishes as engraulids, notopterids, macrourids, *Acerina*, and brotulids (see also Garman, 1899; Pfüller, 1914; Omarkhan, 1949), the troughs in the snout region of *Albula*, *Pterothrissus*, and *Halosauropsis* will be dealt with.

In *Albula* the supraorbital canal of each side passes forward over a nasal and a prenasal ossicle to end blindly at the border of the snout. There is also a rather extensive median cavity in the tip of the mesethmoid. Though this cavity extends laterally into the flesh on either side of the mesethmoid, it does not appear to connect with the supraorbital or infraorbital sensory canals. Whether this cavity represents the ethmoidal commissure of *Elops*, the peculiar median sensory system of eels described by Allis (1903), or whether it is even a part of the sensory canal system is not clear to the present author. In the related *Pterothrissus* (fig. 7), the supraorbital canal extends forward to the snout rim, down which it extends for a short distance before ending blindly. Near its anterior end it is in open connection with its fellow on the other side via a hole through the mesethmoid; on the floor of this transverse opening there is a well-developed neuromast. Other than this opening, there is no median cavity in the mesethmoid.

The infraorbital canal in *Albula* and *Pterothrissus* runs forward to the anterior end of the lacrimal, where it doubles back and up into the antorbital (see below). At its anteriormost point it is joined by another canal which passes through two (*Albula*) or three (*Pterothrissus*) small (lateral rostral?) ossicles and then drops down into the premaxillary, where it runs forward and ends blindly (fig. 7). The canal in the premaxillary of *Albula* and *Pterothrissus* (it also occurs in *Dixonina*) is unique among living teleosts.

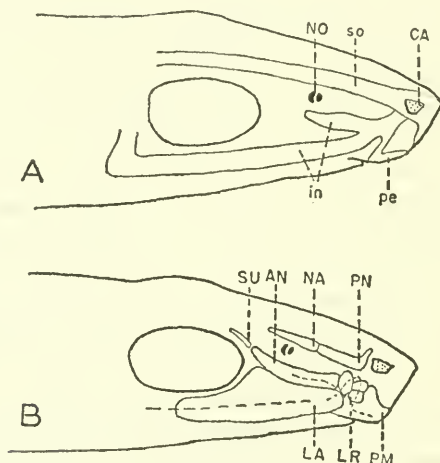


FIG. 7.—Diagrammatic lateral and slightly superior views of the head of *Pterothrissus gissu* (Clupeiformes).

A, Showing the course of the sensory canals of the snout; B, showing the superficial bones of the snout region (the course of the infraorbital system of sensory canals outlined by dashes).

AN, antorbital bone; CA, cavity in mesethmoid by means of which the supra-orbital sensory canals of either side join; in, infraorbital sensory canal; LA, lacrimal bone; LR, lowermost of the three lateral rostral bones; NA, nasal bone; NO, nostril; pe, premaxillary sensory canal; PM, premaxillary bone; PN, prenasal bone; so, supraorbital sensory canal; SU, supraorbital bone.

Halosauropsis (USNM 53615) is the only other fish known to the author besides the elopoids that has small canal-bearing ossicles in front of the lacrimal. Here, as in *Albula* and *Pterothrissus*, there is a trough system of canals and a decidedly subterminal mouth. The supraorbital and infraorbital canals end blindly forward. Just above the premaxillaries on the lower surface of the snout there is a broad cross channel which is only separated from the infraorbital canal on either side by a membrane. Underlying the various canals in the

snout region is a series of six small ossicles on each side, several of these bearing a single neuromast.

The supraorbital and antorbital in relation to olfaction.—For present purposes the nasal organs of the lower teleosts may be divided into three types. One, represented in the fishes examined only by the Beloniformes, has no nostrils and no olfactory laminae, at least in *Cololabis* and *Hyporhamphus*; instead, the nasal tract runs directly to the base of a nasal tentacle which protrudes from a nasal fossa. Variations of this nasal organ in the hemiramphids have been described by Weed (1933, p. 44). A second type of nasal structure consists of a series of transverse laminae lying at the bottom of a nasal capsule that is closed above except for two rather small, well-separated nostrils. The anterior of these frequently opens at the tip of a tube. Water is presumably passed across the nasal epithelium of such an olfactory organ by ciliary action as in *Anguilla* (Liermann, 1933). In fishes with either of the types of nasal organs just noted the surrounding bones appear to have little to do with olfaction, and these types will not be dealt with further.

In the majority of living teleosts, by contrast, there are two relatively large, adjacent narial openings leading into the olfactory capsule on the bottom of which lie the olfactory laminae. From the capsule extend one or more nasal sacs or diverticula. Movement of the bones around these sacs alternately contract and expand them, thus pumping water in and out across the nasal epithelium (Eaton, 1956). It is with certain of the bones involved in this pumping system that the present discussion will be concerned.

The *antorbital* (fig. 7B, *AN*) is a bone rather widely represented among the lower teleosts but apparently incorporated into the lacrimal in higher forms. It undoubtedly originated as a sensory canal bone, but in living lower teleosts it serves primarily as part of the nasal pumping system just mentioned.

For purposes of nomenclature, the "type" antorbital is that of *Amia* (Westoll, 1937, p. 519). However, it seems probable that the antorbital of *Amia* is equivalent to the two lateral rostrals plus the antorbital of *Elops* (cf. Westoll, 1937, p. 519, footnote). In modern teleosts the antorbital becomes associated with the supraorbital bone (fig. 7B) above it and reduces or loses its sensory canal. Even so it remains easily identified by its topographic position and relationships: when present it lies above the lacrimal and borders the nasal openings below; forward it usually has a ligamentous connection with the outer surface of the maxillary. Only when the antorbital is greatly reduced

is it difficult to identify. Nevertheless it passes under a number of names in the literature. Thus Derschied (1924) calls it the adnasal; Gregory (1933) labels the same bone prefrontal in some illustrations (e.g., fig. 32) and lacrimal in others (e.g., fig. 40); and Wohlfahrt (1937), Berg (1940), Kirkhoff (1958), and others have mistakenly identified it as a supraorbital bone. On the other hand Lekander (1949) has, with more justification, called the bone usually termed the lacrimal, the antorbital. In the cyprinids which Lekander studied, the bone in question is very probably a compound structure made up of a fusion of the lacrimal and antorbital, but the latter bone would seem to have formed at most a very insignificant part of the result.

In living teleosts there is at most only one *supraorbital* bone (fig. 7B, *SU*). It never bears a sensory canal and seems to be the sole remnant of a series of bones that formerly protected the upper border of the orbit. In certain scopeliform fishes (e.g., *Aulopus*) the remaining supraorbital forms part of the rigid roof of the orbit, but its retention in modern teleosts is probably attributable to its secondary association with the antorbital as part of the nasal pumping system.

In the majority of modern isospondylous fishes there are two nasal sacs opening off from the nasal capsule (Derschied, 1924). The lower of these passes down and back in front of and below the orbit. Water is pumped in and out of this sac by movements of the lacrimal dorso-lateral to it and the palatine ventromedial to it. (This is the Lacrimal-sack of Liermann, 1933; see also Eaton, 1956.) The upper sac, with which the present discussion is concerned, extends up and back to and sometimes above the upper border of the eye. As Kirkhoff (1958) has clearly shown for *Clupea*, the expansion and contraction of this sac is governed by the linkage of the antorbital (supraorbital I of Kirkhoff) and supraorbital. Movement in the superficial bones of the snout associated with both nasal sacs is ultimately controlled by the opening and closing of the mouth. This is brought about by separate ligamentous attachments between the maxillary and the forward ends of the lacrimal and the antorbital.

Neither the presence of an upper (supraorbital) nasal diverticulum nor of an antorbital-supraorbital link are constant features in the isospondylous fishes (Derschied, 1924). It would seem that wherever a well-developed supraorbital nasal sac is present there is also an antorbital-supraorbital pumping mechanism. However, the supraorbital or antorbital bone may be present in fishes with no supraorbital diverticulum. With this introduction, a brief history of the antorbital and supraorbital bones in living teleosts will be given.

In *Elops* both bones are present (Nybelin, 1957, fig. 2) but do not seem to form a movable link, for the supraorbital bone is tightly attached to the frontal; there is no supraorbital nasal sac (Derschied, 1924, fig. 1,c). *Megalops* differs only slightly in the possession of a small supraorbital nasal diverticulum (Derschied, 1924, fig. 3). In *Albula* there is an elongate, movable supraorbital bone associated with a canal-bearing antorbital (as in *Pterothrissus*, fig. 7B); the supraorbital diverticulum extends well back under the former bone (Derschied, 1924, fig. 4,b).

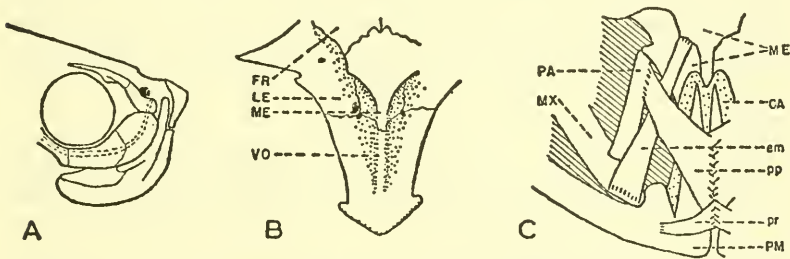


FIG. 8.—A, Snout region of *Pellona* sp. (Clupeiformes).

B, Ethmoid region of cranium of *Mycteroperca* (Perciformes). FR, frontal; LE, lateral ethmoid; ME, mesethmoid; VO, vomer.

C, Snout region of *Mycteroperca* (Perciformes). CA, cartilaginous area under premaxillary pedicels; em, ethmoid-maxillary ligament; ME, mesethmoid bone; MX, maxillary bone; PA, palatine bone; PM, premaxillary bone; pp, palatine-premaxillary ligament; pr, interpremaxillary ligament.

In *Alepocephalus* there is no supraorbital bone and no supraorbital nasal diverticulum of the nasal capsule (Derschied, 1924, fig. 11). There is however an L-shaped antorbital which protects the ventral and posterior borders of the nasal openings, but there is no ligamentous connection between its forward end and the maxillary.

Among the herringlike fishes the suborbital and supraorbital nasal sacs are usually both represented (Derschied, 1924, pp. 98-106, figs. 6-8). The antorbital-supraorbital link is always present (fig. 8A) and perhaps reaches the epitome of its development as a pumping mechanism (Kirkhoff, 1958). Nevertheless, even among this group there seems to be considerable reduction in the size of the diverticula and in the mobility of the dermal bones of the snout in those forms with a heavy covering of adipose tissue in the snout region, e.g., *Dorosoma* and the anchovies. Indeed, in the anchovy examined the supraorbital appears to be rigidly united to the skull.

The great variation in the nasal apparatus and dermal bones of the snout in stomiatooids has been demonstrated by Derschied (1924, pp. 118-128, figs. 12-15). Suffice it to say here that the antorbital-supraorbital link is present in the more primitive genera *Maurolicus*, *Cyclothone*, and *Gonostoma*.

The salmonoid nasal sacs seem to be similar to those of the herrings in that a supraorbital and suborbital diverticulum are both present (Derschied, 1924, pp. 109-115, fig. 10). However, the antorbital-supraorbital-maxillary link never seems to be so well developed. For example, in *Salmo*, which has a very fleshy snout, an antorbital and supraorbital are both present but so deeply embedded that it is difficult to see how opening the mouth could move them. The antorbital and supraorbital are also present in *Coregonus* (Berg, 1940, p. 235, fig. 122) and *Osmerus*, though in the latter the antorbital is rather feeble.

In *Argentina* there is a well-developed supraorbital covering the supraorbital nasal sac, but apparently no antorbital (Chapman, 1942, p. 106, fig. 4). In *Nansenia*, however, a small antorbital is present (Chapman, 1948, p. 10, fig. 5).

In *Galaxias* there appears to be a supraorbital (?) but no antorbital, and in *Salanx* neither bone is present. Among the haplomous fishes there are apparently no nasal sacs and no antorbital. A movable supraorbital is present in *Esox*, but not in *Umbra*.

In *Chanos*, which resembles *Dorosoma* in the heavy layer of adipose tissue in the snout regions, the nasal sacs are again small. The supraorbital is large but movable and lies on the surface of the skull. The small squarish antorbital covers the outer surface of the nasal capsule. Thus the two bones have planes at right angles to one another, and there seems to be little connection between them.

Gonorhynchus seems to be unique in that there is a large nasal sac extending back in the flesh external to the large lacrimal. Antorbital and supraorbital bones are absent.

According to Derschied (1924, p. 159) *Phractolaemus* is even more peculiar in having a transverse canal running between the nasal capsules of the two sides.

Among the osteolosoid fishes there is a most varied and disconcerting series of dermal bone arrangements on the sides of the snout. All are similar in two respects. First, all the members of the group have a rigid cup around the nasal capsule which gives off no diverticula. Second, the bone arrangements around this capsule in no way resemble those of any fish dealt with up to here.

In *Hiodon* the nasal is a tubular, L-shaped bone hooking over and around the front of the nasal capsule in such a way that the front of the supraorbital lateral line canal runs downward and somewhat backward. The infraorbital canal runs forward and stops in a small bone (the lacrimal?) just behind the nasal capsule. The rear of the capsule is rimmed by the lateral ethmoid; this bone does not reach the surface, but just below the skin gives off a forward flange that in lateral view makes the lateral ethmoid look like a circumorbital (see Ridewood, 1904, pl. 25, fig. 20). There is no separate supraorbital.

Pantodon has the suborbitals continued forward as a ring of tubular ossicles well up on the anterior rim of the orbit. The anteriormost of these overlies but is entirely separate from the lateral ethmoid; that it represents the antorbital of the fishes dealt with above seems somewhat dubious.

In *Osteoglossum*, *Heterotis*, and *Arapaima* this anteriormost bone becomes progressively expanded and fuses above with the frontals. In *Osteoglossum* at least, it bears a canal that opens out above into a subdermal space above the surface of the frontals. *Notopterus* has a similar channel in its anteriormost circumorbital.

At this point it may be well to summarize for the isospondylous fishes. The osteoglossoids (along with the mormyroid fishes; see Derschied, 1924, pp. 142-157, figs. 21-25) must be separated off at once because they have a rigidly enclosed nasal capsule without diverticula and no supraorbital bone, the place of the latter sometimes being taken by a canal-bearing antorbital (?) that fuses with the frontal above the eye.

Second, *Gonorhynchus* and *Phractolaemus* must be removed from the others, because of the very peculiar (but very different) cavities connected with their nasal capsules.

Among the remaining clupeiform fishes one or two nasal capsule diverticula and an antorbital-supraorbital link are generally present. At least two lines of evolution have developed from this basic pattern. In *Alepocephalus*, which has a long snout with the nostrils far back, there is a large nasal sac extending forward under the lacrimal, but the supraorbital sac and the supraorbital bone are missing. In the salmonoid series a rather different line of development has taken place. The supraorbital sac is generally retained but the anterior end of the antorbital-supraorbital link degenerates; in *Argentina*, for example, the antorbital seems to be completely missing. Among haplous fishes the antorbital is always missing; a movable supraorbital is present only in *Esox*; and there are apparently no nasal sacs.

With regard to the orders above the isospondylous fishes, I have been able to discover a supraorbital and/or antorbital in only four: the iniomous, ostariophysine, heteromous, and salmopercoïd fishes.² In no members of these examined was there a well-developed supraorbital nasal sac.

In the iniomous genus *Aulopus* there is a well-developed supraorbital bone. It is, however, rigidly attached to the frontal and seems to function as a protecting bone for the upper portion of the eye. The nasal capsule extends back very slightly below its anterior margin. The antorbital forms a long, somewhat curved strut running forward from the front of the supraorbital bone below the nostrils. In *Chlorophthalmus* both supraorbital and antorbital bones are again present. The supraorbital has a somewhat more anterior position than in *Aulopus*. It is less rigidly attached to the frontals, and dips down below the rear border of the nasal capsule. The antorbital is a small ossicle lying above the forward portion of the lacrimal. *Neoscopelus* has a small antorbital but apparently no supraorbital. In the more specialized iniomous fishes examined, e.g., *Parasudis*, neither antorbital nor supraorbital are present, at least as separate elements.

Among the ostariophysine fishes, the antorbital and a somewhat movable supraorbital are present in *Brycon*. The latter bone extends slightly over the nasal cavity. In *Astyanax* there is a small antorbital, but I have been unable to find any supraorbital. In the cyprinids, by contrast, there is usually a supraorbital, but the antorbital generally disappears. Presumably it fuses with the lacrimal.

Among the heteromous fishes there is a very slender antorbital in "*Halosauropsis*" and a somewhat stronger one that bears the anterior end of the infraorbital canal in *Notacanthus*. In neither genus is there any trace of a supraorbital.

Finally in *Percopsis* the infraorbital channel runs forward through the lacrimal, then turns upward through a terminal hoop in that bone and doubles back to end over an ossicle which is undoubtedly an antorbital. The whole arrangement is somewhat reminiscent of *Albula*. In *Aphredodorus* there is no antorbital; the infraorbital canal runs straight forward in the lacrimal and ends there without doubling upward and backward.

In general, it may be said that lower teleostean evolution shows the

² In a stained and cleared specimen of the eel *Ariosoma* there is a minute ossicle above and in front of the lacrimal that may represent the antorbital. Since the above was written an antorbital has also been located in the holocentrid fishes.

antorbital and the one remaining supraorbital bones on their way out. Before disappearing, however, there is a transformation of function of these bones into a pumping mechanism for the supraorbital diverticulum of the nasal capsule. This new function has probably prolonged the evolutionary life of the antorbital and the supraorbital.

The higher teleosts usually have nasal diverticula (cf., Eaton, 1956); however, the supraorbital diverticulum has disappeared. Perhaps it is no coincidence that the supraorbital sac and supraorbital bones drop out just below the level of protrusile premaxillary development (see section IV of this paper), for a protrusile upper jaw would certainly affect the arrangements of any pumping systems in the snout region.

From a phylogenetic standpoint, the antorbital-supraorbital pumping system would seem to be the sort of mechanism that would only have evolved once, for it is made up of rather heterogeneous parts. It seems improbable that the two elements in this link were originally more than casually in contact with one another. If, then, this antorbital-supraorbital link evolved only once, it is evidence that at least the fishes that possess it are of monophyletic origin.

IV. UPPER JAW PROTRUSION IN TELEOSTEAN FISHES

The freeing of the maxillary from the cheek is generally considered a milestone in the evolution of the actinopterygian fishes. The development of a protrusile upper jaw in the teleosts is a further, though probably less fundamental, step in the same general direction.

Probably the principal method of feeding in fishes is to suck the food in with the surrounding water by expansion of the oral and gill cavities. If some method is evolved of shooting the mouth opening forward at the same time the suction is developed, the chances of catching any moving prey should be increased. This, in its barest terms, would seem to be the basic advantage of a protrusile upper jaw.

There are, of course, a number of supplementary considerations. For example, fishes have on the one hand found it possible to adapt such a protrusile jaw for other types of feeding, e.g., the nipping structure of the parrot fishes. On the other, there are some types of feeding in which a protrusile upper jaw may be disadvantageous. Thus, many fishes feeding on large prey have redeveloped fixed premaxillaries, e.g., barracudas, gempylids, tunas, most carangids. Furthermore, even those fishes in which the pipette system of feeding is developed to its greatest extent, i.e., the pipefishes and sea horses, do

not have a protrusile upper jaw. On balance, however, there are probably more fish species living today that have a protrusile upper jaw than there are species that do not.

The fact, noted above, that many fishes have lost the protrusile premaxillaries often makes it difficult to state definitely that a fish with a fixed jaw never had a protrusile jaw.

In the percoid type of jaw protrusion the mesethmoid and vomer have a median ridge (fig. 8B) which forms a rail along which the premaxillary heads (pedicels) slide. This prohibits lateral dislocation. The premaxillaries are held pressed to the rail by a series of ligaments. At the front the two premaxillaries are bound to one another, and anterolaterally are held in place by the palatine-premaxillary ligament (fig. 8C); posteriorly they are firmly tied to the maxillary and the lower jaw.

When a fish with protrusile premaxillaries of the percoid type opens its mouth, the upper jaw automatically slides forward and downward along the ethmovomerine ridge. The anterior portions of the premaxillaries are wedged forward by the outward rotation of the anterior maxillary heads; this rotation is associated in turn with movement of the forward end of the palatine (van Dobben, 1935). The posterior ends of the premaxillaries are forced forward and downward by the lowering of the mandible.

Thus protrusion of the premaxillaries is accomplished by a rather complex mechanism. Nevertheless, all the basic elements necessary for the percoid type of premaxillary protrusion would seem to be present at least as far back as the basal scopeliform fishes, e.g., *Aulopus*. Furthermore, even in such clupeiform fishes as *Megalops* and *Clupea* (Kirkhoff, 1958) the whole system of ethmoid-palatine-maxillary-premaxillary articulations and ligamentous connections is present and the premaxillaries are to some extent automatically rotated, if not protruded, when the mouth is opened. In actual practice the only criterion the author has been able to find for whether the premaxillaries can or cannot be protruded is the presence or absence of an infolding of the skin across the front of the snout behind the upper jaw: where a broad or narrow frenum is present between the cranium and the upper lip, it is assumed that the premaxillaries are nonprotrusile.

The teleostean orders (following Berg's 1940 classification) in which a protrusile upper jaw is present are the following: Clupeiformes (*Gonorhynchus* (?) and *Phractolaemus* only), Bathyclupeiformes, Ateleopiformes, Cypriniformes (Cyprinoidei), Gadiformes,

Macruriformes, Gasterosteiformes, Lampridiformes, most Cyprinodontiformes, Phallostethiformes, Stephanoberyciformes, Beryciformes, Mugiliformes, and most higher teleostean orders.

Of these, the very peculiar mouth structure of the isospondylous *Phractolaemus* has been taken up briefly by Ridewood (1905, p. 279). It seems to be constructed on a very different plan from that of the percoids. In *Bathyclupea* the protrusile jaw is typically percoid, as indeed is the fish itself. The protrusile, somewhat tubular mouth of ateleopids seems never to have been adequately described; no specimens are available to this author for dismemberment of the mouth parts. The protrusile upper jaw of cyprinoid fishes has been dealt with a number of times (cf. Fiebiger, 1931; Gregory, 1933); its construction is very different from that of the percoid fishes and certainly represents an independent development.

In most of the rest of the fishes with a protrusile premaxillary there is a basic structure essentially similar to that of the percoids. So far as the structural elements mentioned in the description of the percoid jaw are concerned, there would seem to be no basic difference between the protrusile upper jaws of the cods, sticklebacks, holocentrids, and phallostethids and those of the percoids. Whether, however, the peculiar type of jaw protrusion found in the Lampridiformes (Regan, 1907) is of basically percoid type or has been derived independently is a question about which the author has no first-hand information.

The cyprinodonts, some of which have a protrusile and some a fixed upper jaw, form a rather special category. Eaton (1935, pp. 166-167) has stressed the similarities in jaw structure between *Fundulus* and the Percesoces. There are certainly superficial resemblances between *Mugil* and *Fundulus*, but I believe these to be secondary. The peculiarities of the mugilid jaw structure can be traced, via the atherinids and sphyraenids, directly back to the percoid type. The protrusile upper jaw of cyprinodonts operates on a rather different system. In *Fundulus*, *Belonesox*, *Rivulus*, *Goodea*, *Orestias*, and others the premaxillary ends laterally in a strong downward hook which is membranously attached to the coronoid portion of the lower jaw forward, more or less independently of the maxillary. Lowering of the mandible thus forces the premaxillary forward. The maxillary apparently has very little to do with premaxillary protrusion.

Among cyprinodont genera with a nonprotrusile premaxillary, *Oryzias* has the same downward process at the tip of the premaxillary as *Fundulus* and the others mentioned. Loss of protractile premaxillaries is here undoubtedly a secondary character. In *Chologaster* and

Typhlichthys, however, the premaxillaries are not only nonprotractile, but have no downward hook at the tips, tapering laterally to a point as is usual in fishes. The inference would seem to be that the premaxillaries of these two genera represent the primitive condition, and that a peculiar protractile mechanism has developed within the cyprinodonts.

To summarize the foregoing material, it may be said that the following orders usually placed below the Perciformes have basically protrusile upper jaws: Gadiformes (with Macruriformes), Gasterosteiformes, Lampridiformes, Beryciformes, Zeiformes, Phallostethiformes, and Pleuronectiformes. The following orders have basically fixed premaxillaries but have one or more members developing a protrusile upper jaw: Clupeiformes, Cypriniformes, and Cyprinodontiformes.

A few concluding notes may be added concerning certain groups with nonprotrusile premaxillaries. It would appear, as already mentioned, that all the elements necessary for a protrusile jaw mechanism are present in the basal scopeliform fishes; nevertheless, the final step of actual jaw protrusion has apparently not been taken. What has just been said applies equally well to the Percopsiformes. The possibility, which the author, at least, cannot refute, exists for such groups that the lack of a protrusile jaw is here due to secondary loss.

The upper jaw structure of the Syngnathiformes is very different. Here, in *Fistularia* and *Aulostomus*, at least, the premaxillaries have no pedicels and are bound by a continuous membrane to the anterior heads of both the maxillaries and palatines. Indeed the whole upper jaw structure appears specialized in a direction which is very different from that of the Gasterosteiformes and Perciformes.

DISCUSSION

It remains to integrate the four structural systems that have been followed in the preceding sections with one another and with the existing classification of modern teleostean fishes. This can perhaps best be done by taking up one by one the lower teleostean orders as given by Berg.

Clupeiformes.—In a previous paper the author (Gosline, 1960) has dealt with the classification of this group. There a major line was drawn between a division Clupei, including *Gonorhynchus* and the haplous fishes, and a division Osteoglossi. The nasal structures noted in the present paper would seem to reinforce such a classification, for the Osteoglossi never have nasal sacs whereas the Clupei

usually do. In relation to this structural difference the supraorbital-antorbital and lacrimal pumping mechanisms so typical of the Clupei are never present in Osteoglossi, in which the area usually occupied by these bones is filled by a varied series of bones rather difficult to interpret. Certainly some members of the Clupei have also lost their nasal diverticula, e.g., *Esox* and *Umbra*, but in these the bones of the snout region have never progressed so divergently as in the Osteoglossi.

In the same paper (Gosline, 1960) the elopids and albulids were placed together in the suborder Elopoidi of the division Clupei. The presence of sensory canals in the premaxillaries of albulids, unique among recent teleosts, points up once again the divergence between these two groups.

Bathyclupeiformes.—It has been adequately demonstrated by others that the single contained family belongs in the Perciformes.

Galaxiiformes.—Berg erected this order for the genera *Galaxias* and *Neochanna*. Gosline (1960) has followed the more usual taxonomic procedure of grouping these genera with *Prototroctes*, *Lovettia*, *Aplochiton*, and *Retropinna* (and of placing the whole assemblage in the Clupeiformes). The possibility that Berg is correct in removing *Galaxias* and *Neochanna* from the other genera mentioned probably deserves further attention.

Scopeliformes.—The presence of fulcral scales and of well-developed temporal fossae in the rear of the skull of the basal iniomous genus *Aulopus* makes it impossible to derive the Scopeliformes from anything higher in the scale of modern teleosts than the elopoid Clupeiformes. (For a discussion of the relationship between the Scopeliformes and Clupeiformes, see Gosline, in press.)

Ateleopiformes, *Giganturiformes*, and *Saccopharyngiformes*.—The present author has no new information on these groups.

Mormyriiformes.—The close resemblance between the caudal skeleton of these fishes and those of the osteoglossoids (Gosline, 1960) bears out the interrelationship between these groups hypothesized on other grounds.

Cypriniformes.—The rather remarkable similarity between the caudal skeleton of the characin *Brycon* and that of the round herrings has been remarked upon in section I of this paper. In pelvic osteology, however, *Brycon* appears to be more generalized than the modern herrings.

Anguilliformes.—No new information can be added here. Suffice it to say that the eel jaw structure can be derived only from that of the Clupeiformes among living teleosts.

Halosauriformes.—The palatine-maxillary articulation and the sensory canals of the head of halosaurids suggest a relationship with *Albula* and *Pterothrissus*. The pelvic organization is typical of the *Clupeiformes*.

Notacanthiformes.—Though highly specialized there seems to be no reason to believe that this group is not most closely related to the halosaurids, even though the pelvic structure of notacanthids is unique.

Beloniformes.—This group is so specialized that few inferences concerning relationship can apparently be drawn from the structures treated above. The pelvic osteology does suggest that of the inious fishes.

Gadiformes and *Macruriformes*.—The protrusile upper jaw of these fishes seems to be essentially of perciform type.

Gasterosteiformes.—Another group with a typical protrusile perciform upper jaw.

Syngnathiformes.—This group seems to differ from the *Gasterosteiformes* about as widely as possible in upper jaw structure.

Lampridiformes.—Nothing to be added here.

Cyprinodontiformes.—The protrusile upper jaw, where it occurs in these fishes, is different from that of the percoids and, judging from *Amblyopsis* and *Chologaster* which have fixed upper jaws, a protrusile jaw mechanism has been independently developed within the group. The caudal skeleton of the basal members *Amblyopsis* and *Chologaster* is highly peculiar but bears some resemblance to that of the *Percopsiformes*.

Phallostethiformes.—A typical perciform upper jaw.

Percopsiformes.—Though the caudal skeleton is specialized in a direction peculiar to this order and apparently the *Cyprinodontiformes*, the pelvic structure and antorbital bone indicate a "lower" teleostean condition. The ensemble of characters suggests that the *Percopsiformes* may be an offshoot of a primitive scopeliform or protoscopeliform stock.

Stephanoberyciformes.—Nothing to be added here.

Beryciformes.—In pelvic structure a scopeliform derivation is suggested. The protrusile jaw seems to be typically perciform. So far as the living teleosts are concerned a "true," percoid-type pelvic spine seems to be present for the first time here.

Zeiformes.—The protrusile upper jaw, pelvic structure, and caudal skeleton all appear to be percoid.

Mugiliformes, *Polynemiformes*, *Ophiocephaliformes*, and *Symbranchiformes*.—Nothing to be added.

In conclusion it seems relevant to discuss groupings of modern teleostean orders. The older divisions such as that between the Malacopterygii and Acanthopterygii or between Physostomi and Physoclisti need no present consideration. The defect of all such systems lies in the fact that any one character may have been lost or gained independently many times in teleostean evolution. That independent lineages may lose a character, e.g., the connection between the air bladder and the esophagus, is fairly obvious. That a character may be and often is gained in independent lineages is sufficiently indicated by the fact that the consolidation of lepidotrichia into spinelike structures has taken place time and again in teleosts, e.g., in the Cypriniformes, Notacanthiformes, Cyprinodontiformes, and Perciformes. As with the protrusile upper jaw, teleosts seem to have tried out fin spines in a number of ways before developing the generally satisfactory

Orders with the following percoid-type structures :

Branchiostegal rays	Protrusile premaxillaries	Pelvic spine
Syngnathiformes
Percopsiformes
Cyprinodontiformes
Gadiformes	Gadiformes	...
Macruriformes	Macruriformes	...
Lampridiformes	Lampridiformes(?)	...
Gasterosteiformes	Gasterosteiformes	Gasterosteiformes
Beryciformes	Beryciformes	Beryciformes
Zeiformes	Zeiformes	Zeiformes
Higher orders	Higher orders	Higher orders

Diagram 3.

type found in the perciform fishes; or, alternatively (as suggested by the notacanthids), a generally adaptable type of fin spine may have been developed only after the lineage had specialized too far in other ways to allow much adaptive radiation. In any event, a formal division of the teleostean fishes based on a single character, whether one of loss, e.g., Physostomi, or of new development, e.g., Acanthopterygii, is open at least to grave suspicion.

Insofar as such a basis of division is valid at all, the characters of the hyoid arch (Hubbs, 1919), the development of a percoid type protrusile upper jaw, and the formation of a single "true" outer pelvic spine would seem to provide the most useful dividing lines (diagram 3). As may be seen from this diagram these three features furnish a division between a "lower" and a "higher" group of orders at roughly but not exactly the same point.

There seems little use in weighing the relative merits of these three dividing lines. Still less is there any point in recognizing the groups on either side of any of these lines in a formal classification. Each of them merely represents a level of organization in a single structure, which, like fin spines, may have been attained independently several times, or secondarily lost. (Nevertheless it is perhaps of some significance that some fishes of questioned affinity, e.g., the sticklebacks, always fall into a "higher" group in whichever of the three ways a dividing line is drawn.) For the present, then, it seems most convenient merely to speak of the percoids and their derivatives as "higher teleosts" and the isospondylous fishes and their derivatives that have not attained the percoid phase as "lower teleosts." To adopt this system, as is done here, has at least the advantage of attempting to recognize phylogenetic rather than level-of-organization groupings.

In further conclusion, a preliminary attempt will be made to carry through the idea of phylogenetic groupings within the "lower" teleosteans. To start at the bottom with the isospondylous fishes, it hardly matters for present purposes whether the group is polyphyletic or not. In either event there seems to be a basic cleavage between a *Hiodon*-osteoglossoid group and the remaining isospondylous forms. The *Hiodon*-osteoglossoid section (division Osteoglossi of Gosline, 1960) seems to have given rise to the mormyrids and their allies. The remainder (division Clupei), judging from the continuity of the supraorbital-antorbital stay (section III), etc., would seem to have given rise to most if not all other teleostean orders.

As a second step it may be noted that there is a series of orders—Clupeiformes, Halosauriformes, Notacanthiformes, and Cypriniformes—in which the basal members at least have the innermost radial of the pelvic fin present as a separate nodule. There is another group—Scopeliformes, Beloniformes, Percopsiformes, and Beryciiformes—in which this same radial is fused to the base of the lower half of the inner pelvic ray (section II). Now, this difference is neither of any great structural importance nor is it absolute. Nevertheless, those orders with a free inner radial all have the maxillary typically included in the gape, whereas those orders with the inner radial and ray fused all have the maxillary excluded. Primarily on the basis of this combination of characters it is here suggested that there is a series of lower teleostean orders derived from the division Clupei that never reached a scopeliform stage of evolution and another series derived from the same source that did. (The eels must be included in the former group even though today they have no pelvic fins).

A final grouping of orders may be suggested on the basis of a number of minor features: the presence of a protrusile jaw and of a single pelvic spine developed from a soft ray, general similarity of caudal skeleton, and others. This group includes the berycoids, zeoids, and percoids.

The general relationships hypothesized in the above paragraphs are summarized in diagram 4 (which, incidentally, incorporates the string-of-beads concept objected to earlier in the paper). A number

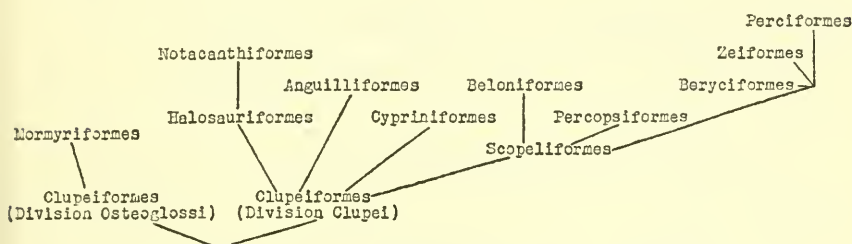


Diagram 4.

of minor and several major groups have been left out of this diagram (which is after all only a sort of temporary clothes rack to work with and from). The most important of these are the anacanthine, syngnathiform, gasterosteiform, cyprinodontiform, and lampridiform groups. Where any of these came off from what appears to be the main isospondylous-iniomous-berycoid-percoid route of teleostean evolution, the present author is not prepared to say.

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SMITHSONIAN MISCELLANEOUS COLLECTIONS
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Charles D. and Mary Vaux Walcott
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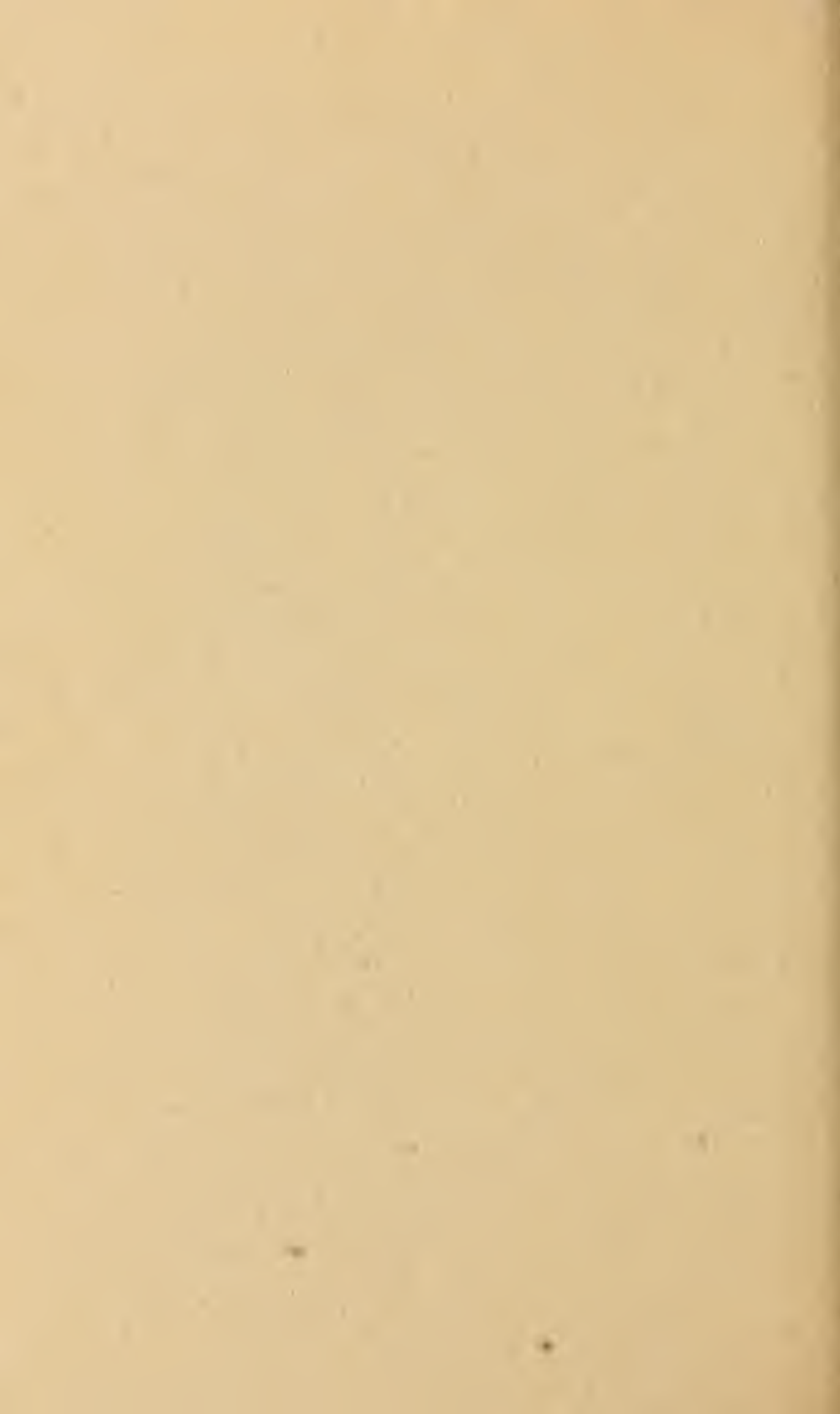
(WITH 14 PLATES)

By
C. WYTHE COOKE
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(PUBLICATION 4459)

CITY OF WASHINGTON
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(WITH 14 PLATES)

SOURCES OF INFORMATION

Most of the fossils described herein were received by the United States National Museum in 1959 and 1960 from Richard L. Casanova as an exchange with the Paleontological Research Laboratory at Statesville, N. C. The Museum also contains a large collection of West Indian echinoids obtained many years ago from R. J. L. Guppy. This includes not only Guppy's own specimens from Trinidad but also the Cleve collection, chiefly from St. Bartholomew and Anguilla, which was reported on by G. H. Cotteau (1875) and was restudied by Jackson (1922). Other types from the Caribbean region in the National Museum are those of Jackson (1917, 1918, 1937) from the Canal Zone and Costa Rica and from Mexico. Most of my own types from Venezuela (Cooke, 1941a), Colombia (Cooke, 1955), Guatemala (Cooke, 1949b), Peru (Cooke, 1949a), and Panama (Cooke, 1948) are in the National Museum, as well as the large collections from the Cretaceous and Cenozoic formations of the United States (Cooke, 1941b, 1942, 1946, 1953, 1959), including the types of W. B. Clark and Twitchell's (1915) monograph.

The echinoid faunas of much of the West Indian region are well known. The most comprehensive papers are by Cotteau (1875) on St. Bartholomew and Anguilla, Jackson (1922) on the West Indies, Egozcue y Cía (1897) and Sanchez Roig (1923, 1926, 1949) on Cuba, and Arnold and H. L. Clark (1927, 1934) on Jamaica.

Little has been published about the echinoids of Trinidad and Venezuela. The first publication is the description by Guppy (1866) of *Echinolampas ovum-serpentis*, later called *Haimea*, from Trinidad. Jackson (1922) added one new species, *Peronella mirabilis*, here referred to *Weisbordella*, also from Trinidad. Seventeen species, for the most part from Venezuela, were described as new by Jeannet

(1928) from collections made in Trinidad by H. G. Kugler and in Venezuela by Kugler, Wiedenmayer, and Vonderschmitt. These collections evidently were not exhaustive, for several of the species are represented by a single fragment. One late-Eocene species, *Oligopygus nancci* Cooke (1941a) was later obtained from Venezuela, and Anisgard (1954) figures an unnamed species of *Plagiobrissus* from a deep well in Venezuela.

The geology of Trinidad is discussed by Suter (1960) and by Kugler (1956). The stratigraphy of Venezuela is also well known because of the many years of research by petroleum geologists. Their results are summarized in a "Léxico estratigráfico de Venezuela" (Schwarck Anglade, 1956), a book of 729 pages containing signed articles on each geologic formation and ending with a bibliography of several hundred titles of works on Venezuela, Trinidad, the West Indies, and some of broader interest.

The geologic names and the stratigraphic horizons assigned to the species from Venezuela in the present report agree, for the most part, with those found in the "Léxico." Because of my unfamiliarity with the region I have had to depend chiefly on the formation names and ages designated on the labels accompanying the fossils, without the ability to evaluate them. As some of the fossils were collected many years ago, it is quite likely that the stratigraphic data need revision.

SPECIES OF EARLY CRETACEOUS AGE

Seven species of Early Cretaceous age, six from some part of the Albian, one from the Aptian, are here recorded from Venezuela. Four of the genera and two of the species occur also in Colombia, where Cooke (1955, p. 87) reports eight species believed to be of late Albian age. Several species from both Venezuela and Colombia occur also in the Comanche series of Texas (Cooke, 1946) or are represented there by very closely related forms. The species from Venezuela are as follows:

Tetragramma sp.

Holectypus (*Caenholectypus*) *planatus aponensis* Cooke, n. subsp.

Phyllobrissus zulianus Cooke, n. sp.

Enallaster (*Washitaster*) *bravoensis* Böse?

Pseudananchys sp. indet.

Hemiaster sp.

Epiaster whitci Clark

SPECIES OF PALEOCENE AGE

The only echinoid thus far recognized as of Paleocene age in this region is *Phymosoma trinitensis* Cooke, n. sp. As the name indicates,

it was found in Trinidad. Its affinities appear to be with Cretaceous rather than Eocene species. This is in accordance with the Paleocene fauna of the United States, which includes more genera reminiscent of the Cretaceous than of the Eocene (Cooke, 1959, p. 2).

SPECIES OF MIDDLE EOCENE AGE

One species, *Fibularia farallonensis* Cooke, n. sp., was collected by J. A. Bullbrook on Farallon Rock, near San Fernando, Trinidad. According to W. P. Woodring (oral communication), H. G. Kugler regards this rock as representing a reef facies of the Navet formation of middle Eocene age. This correlation seems to be supported by the echinoid, which is similar to *Fibularia texana* (Twitchell) from the middle Eocene Weches greensand member of the Mount Selman formation of Texas.

SPECIES OF LATE EOCENE AGE

Seven species of echinoids from Trinidad or Venezuela are referred to the late Eocene. None are new. Their names are as follows:

- Oligopygus wetherbyi kugleri* Jeannet (from Trinidad)
- Oligopygus haldemani costuliformis* Jeannet (from Trinidad)
- Oligopygus rotundus* Cooke (from Trinidad and Venezuela)
- Oligopygus nancei* Cooke (from Venezuela)
- Haima ovum-serpentis* (Guppy) (from Trinidad)
- Weisbordella mirabilis* (Jackson) (from Trinidad)
- Eupatagus clevei* (Cotteau) (from Venezuela)

Of these seven species, typical *Oligopygus wetherbyi* de Loriol and typical *Oligopygus haldemani* (Conrad) are restricted to the Ocala limestone (Crystal River limestone of Puri), the youngest formation of late Eocene age in Florida. Both subspecies are known only from the San Fernando formation of Trinidad. *Oligopygus rotundus*, described originally from the Moodys Branch (?) formation of Alabama, occurs also in the San Fernando formation and in the Tinajitas formation of Venezuela. *Oligopygus nancei* is known only from the Tinajitas formation of Venezuela. *Haima ovum-serpentis*, typically from the San Fernando formation, occurs also in the St. Bartholomew limestone of the British West Indies. *Weisbordella mirabilis* has been found only in the San Fernando formation, but it is closely related to, possibly only a variant of, *Weisbordella johnsoni* (Twitchell), a species abundant in the Ocala limestone. *Eupatagus clevei*, typically from the St. Bartholomew limestone, occurs also in the Inglis limestone of Florida (Cooke, 1959, p. 89) and in the Gatuncilla formation of Panama (Cooke, 1948; Woodring, 1957, p. 22). The formations

containing *Eupatagus clevei* in Venezuela and in Jamaica (Arnold and Clark, 1934) are not specified.

The Inglis limestone and the Moodys Branch formation are contemporaneous, both of late Eocene age but older than the Crystal River limestone. The St. Bartholomew limestone contains several species of mollusks (Cooke, 1919, p. 106) and echinoids (Jackson, 1922, p. 8) of late Eocene age, though it is sometimes classified as middle Eocene (Woodring, 1957, p. 22) on the evidence of the Foraminifera.

The evidence of the echinoids indicates that the St. Bartholomew limestone is of late Eocene age. Jackson (1922, p. 8) lists 17 named species of echinoids from the St. Bartholomew and referred the formation to the late Eocene. The following revised list shows also the nearest relative in the United States and the geologic range if known. The evidence for a late Eocene age is apparent.

Echinoids from the St. Bartholomew limestone

Name used by Jackson	Revised name or affinity	Eocene	
		Middle	Late
<i>Cidaris loveni</i> Cotteau	= <i>Phyllacanthus mortoni</i> (Conrad)	x	x
<i>Sismondia antillarum</i> Cotteau	<i>Neolaganum antillarum</i> (Cotteau)		
	Aff. <i>Neolaganum dalli</i> (Twitchell)	x	?
<i>Parapygus antillarum</i> (Cotteau)			
<i>Echinolampas antillarum</i> Cotteau			
<i>Echinolampas ovumserpentis</i> Guppy	<i>Haimca ovum-serpentis</i> (Guppy)		x
<i>Echinolampas clevei</i> Cotteau			
<i>Asterostoma cubense</i> Cotteau			
<i>Agassizia inflata</i> Jackson	= <i>Agassizia floridana</i> de Loriol		x
<i>Prenaster loveni</i> Cotteau			
<i>Paraster antillarum</i> (Cotteau)	= <i>Ditremaster subcylindricus</i> (Cotteau)		
	Aff. <i>Ditremaster beckeri</i> (Cooke)		x
<i>Paraster subcylindricus</i> (Cotteau)	<i>Ditremaster subcylindricus</i> (Cotteau)		
<i>Periaster elongatus</i> Cotteau			
<i>Plagiobrissus loveni</i> (Cotteau)			
<i>Macropneustes antillarum</i> (Cotteau)	<i>Schizobrissus jacksoni</i> Lambert		
<i>Eupatagus grandiflorus</i> (Cotteau)	= <i>Eupatagus clevei</i> (Cotteau)		
<i>Eupatagus clevei</i> (Cotteau)			x
<i>Eupatagus antillarum</i> (Cotteau)			x

SPECIES OF MIOCENE AGE

The species indicated as probably occurring in beds of Miocene age, though some persist to the Recent, are as follows:

Encope secoensis Cooke, n. sp.
Encope michelini Agassiz
Encope kugleri Jeannet
Encope (Melitella) falconensis Cooke, n. sp.
Clypeaster rosaceus (Linnaeus)
Echinolampas lycopersicus Guppy
Cassidulus falconensis (Jeannet)
Brissopsis antillarum Cotteau
Antillaster lamberti Jeannet
Pericosmus stehlini Jeannet
Brissus unicolor (Leske)
Plagiobrissus grandis (Gmelin)?
Rhynobrissus rostratus Cooke, n. sp.
Lovenia cf. *L. dumblei* Kew

At least two horizons of Miocene age are represented in this list. The older is that of the Anguilla limestone of the British West Indies, which seems to be coeval with the Chipola formation of Florida. Its occurrence in Trinidad and Venezuela is indicated by *Echinolampas lycopersicus*, described originally from Anguilla and believed to be restricted to that horizon. Another species described from Anguilla is *Brissopsis antillarum*. This, however, is less dependable, for it may have a longer range. Several species from the "couches d'Ojo de Agua" were referred to the middle Miocene by Jeannet (1928). The name Ojo de Agua, according to the "Léxico" (Schwarck Anglade, 1956, p. 460), has been used for two formations, one of middle Miocene age, the other predominantly upper Miocene.

The younger horizon includes the Springvale formation of Trinidad and the Chiguaje and La Vela formations of Venezuela, which are classified as late Miocene and presumably are about the age of the Duplin marl of the Carolinas and Florida. Among the species from these late Miocene formations may be mentioned *Encope falconensis* and *Rhynobrissus rostratus*, but both of these species may have a longer range.

SPECIES OF PLIOCENE AGE

The species attributed to the San Gregorio formation include *Lytechinus variegatus* (Leske), *Encope secoensis* Cooke, n. sp., *Encope (Melitella) falconensis* Cooke, n. sp., *Moira atropos* (Lamarck), and *Agassizia scrobiculata* Valenciennes. The *Lytechinus* and the *Moira* are still living in Atlantic waters, but *Agassizia scrobiculata*

is extinct there, though it now lives in the Gulf of California and in the Pacific Ocean.

DESCRIPTIONS OF SPECIES

MESOZOIC SPECIES

TETRAGRAMMA sp.

Two fragments resembling *Tetragramma streeruwitzi* (Cragin) (Cooke, 1946, p. 208, pl. 31, fig. 23) in all recognizable features are too poorly preserved for specific identification. The apical system is wanting. The poriferous zones are biserial on the upper part of the test, uniserial below. There are two rows of large perforated, crenulated tubercles in each ambulacrum, six in each interambulacral area. The median part of the latter contains only granules.

Occurrence.—Venezuela: El Pao, "Ojo de Agua," Cojedes (Mene Grande Petroleum Co. B-2454).

Geologic horizon.—No data. Early Cretaceous, presumably late Albian.

HOLECTYPUS (CAENHOLECTYPUS) PLANATUS APONENSIS Cooke, n. subsp.

Pl. 2, figs. 4-5

This subspecies, represented by only one individual, whose upper surface is defective, differs from the typical *Holectypus planatus* Roemer (Cooke, 1946, p. 217, pl. 32, fig. 13; 1955, p. 94, pl. 21, figs. 1-3) in its lesser height and more acute margin. This shape appears to be original, not caused by compression. The typical form is abundant in the Trinity and Fredericksburg groups of Texas, of early and middle Albian ages. It has been recorded also from the late Albian of Colombia (Cooke, 1955, pp. 87, 94).

Occurrence.—Venezuela: Río Apón, Zulía (Creole Petroleum Co. 50878).

Geologic horizon.—Early Cretaceous: Capacho formation, of middle Albian to Vraconian age.

Holotype.—USNM 131169.

PHYLLOBRISUS ZULIANUS Cooke, n. sp.

Pl. 1, figs. 10-12

Test subquadrate, rounded in front, truncated behind, sides nearly parallel. Upper surface slightly inflated, highest point at the apical system, sloping more steeply in front, less steeply behind; lower sur-

face concave around the peristome; margin rounded. Apical system monobasal, slightly anterior, four genital pores; madreporite star shaped, central. Petals alike, extending nearly to the margin; poriferous zones very slightly arched, separated at the distal ends; inner pores circular, outer pores elongated, pores conjugate; interporiferous zones wider than the poriferous. Peristome defective; slightly anterior, more nearly central than the apical system. Periproct supramarginal, about one-third the way from the posterior margin to the apical system, twice as long as wide, flush, at the upper end of a shallow depression that indents the margin. Tubercles scrobiculate, more numerous and larger on the lower surface than elsewhere.

Length 46 mm.; width 42 mm.; height 18 mm.

Occurrence.—Venezuela: Roas Island, Zulia.

Geologic horizon.—Early Cretaceous: Apón formation, of Aptian age.

Holotype.—USNM 131167.

Comparisons.—The holotype, a unique specimen, is nearly twice as long and wide but proportionately lower than *Phyllobrissus gresslyi* (Agassiz), the type species of the genus, as figured by Orbigny (1854-1860, p. 425, pl. 966, figs. 1-6) under the genus *Clypeopygus* but referred to *Phyllobrissus* by Cotteau (Orbigny, 1854-1860, p. 553). The periproct is proportionately longer and narrower, and it is farther forward.

ENALLASTER (WASHITASTER) BRAVOENSIS Böse

Pl. 1, figs. 1-4

Enallaster bravoensis Böse, 1910, Inst. Geol. México Bol. 25, p. 168, pl. 41, figs. 5-10; pl. 42, figs. 2-12; pl. 43, figs. 1-2, 6-7.

Enallaster (Washitaster) bravoensis Böse. Cooke, 1955, U. S. Geol. Surv. Prof. Pap. 264-E, p. 106, pl. 27, figs. 5-12. Includes additional synonymy.

The single *Enallaster* here tentatively referred to *E. bravoensis* has the shape and lies within the size range of that species. It retains traces of a broad granular band surrounding the petals, on which band can be detected obscure narrow streaks of granules or fascioles like those characterizing *Washitaster*.

Occurrence.—Venezuela: Río Socuy, Zulia (Creole Petroleum Co. 50878).

Geologic horizon.—Early Cretaceous: Cogollo limestone, probably of late Albian age. The type of *Enallaster bravoensis* came from Cerro Muleros in Mexico near El Paso, Tex., and the species is abundant in the Ranchería Valley of Colombia (Cooke, 1955). In

all these places it occupies beds of late Albian age. The label accompanying the specimen from Venezuela specifies "Cenomanian, Cogollo limestone." As the Cogollo ranges in age from Aptian to Cenomanian (Wolf Maync in Schwarck Anglade, 1956, p. 172), and as *Enallaster* is not known to occur in the Cenomanian of Texas, this specimen is probably of Albian, not Cenomanian, age.

Occurrence.—Venezuela: Río Socuy, Zulia (Creole Petroleum Co. 64769). Another *Enallaster*, too poorly preserved for specific identification but resembling *E. bravoensis*, comes from Río Apón, Zulia (Creole Petroleum Co. 50878).

Figured specimen.—USNM 131170.

PSEUDANANCHYS sp. indet.

Several fragments of a species of *Pseudananchys* are embedded in hard calcareous rock. One of them retains the disjunct apical system, and all show the characteristic elongated ambulacral pores. The anterior petal is like the others.

Occurrence.—Venezuela: Island of Chimana Grande, off Puerto La Cruz, District of Bolívar, Anzoátegui (Mene Grande Petroleum Co. B-1615).

Geologic horizon.—Early Cretaceous: Chimana formation, of early to middle Albian age.

HEMIASTER sp.

Pl. 1, figs. 5-9

Weakly cordate, with a shallow depression in front and a narrow truncation behind; upper surface moderately inflated, highest point in front of the apical system; posterior end sloping downward and backward at an angle of about 45° . Apical system slightly anterior; four genital pores rather far apart, equally spaced. Anterior ambulatory somewhat sunken; pores of petaliferous part short, circumflexed. Paired petals moderately sunken; the anterior pair slightly the longer, extending about two-thirds the way to the margin; pores elongated, widely spaced; poriferous zones open distally; interporiferous zones equal in width to the poriferous zones. Peristome far forward. Periproct oval, near the top of the posterior sloping truncation. Faint traces of a peripetalous fasciole.

Length 41 mm.; original width about 32 mm.; height about 23 mm.

Occurrence.—Venezuela: Location unknown, Monagas (Creole Petroleum Co. 19838).

Geologic horizon.—Early Cretaceous.

Figured specimen.—USNM 131168.

Comparison.—*Hemiaster* sp., known only from two specimens, one very much corroded, is most closely related to *Hemiaster calvini* Clark (Cooke, 1946, p. 225, pl. 32, fig. 5) from the Washita group of Texas; but it is lower, its petals are shallower, and its posterior truncation slopes less steeply.

EPIASTER WHITEI Clark

Pl. 2, figs. 6-9

Epiaster whitei Clark, 1891, Johns Hopkins Univ. Circ., vol. 10, No. 87, p. 77.

Epiaster whitei Clark. Clark, 1893, U. S. Geol. Surv. Bull. 97, p. 82, pl. 43, figs. 2a-d; pl. 44, figs. 1a-g.

Hemiaster whitei (Clark) (part). Clark, 1915, U. S. Geol. Surv. Monogr. 54, p. 89, pl. 43, figs. 2a-c; pl. 44, figs. 1a-h. Not pl. 45, figs. 1a-c (type of *Macraster washita* Lambert).

Hemiaster whitei (Clark). Cooke, 1946, Journ. Paleont., vol. 20, No. 3, p. 224, pl. 32, figs. 16-17. Includes additional synonymy.

Epiaster whitei Clark. Cooke, 1955, U. S. Geol. Surv. Prof. Pap. 264-E, p. 108.

Cordate, with a shallow depression in front and a narrow vertical truncation behind; moderately inflated, margin rounded; highest point at the apical system, evenly rounded in front, gently sloping behind to the truncation; widest at the anterior third; sides evenly rounded to the anterior depression, straighter behind. Apical system slightly anterior; ethmophractic, the two posterior genital plates touching, the madreporite not protruding between them; four genital pores, nearly equally spaced. Anterior ambulacrum depressed; pores short, outer pores transverse, inner pores diagonal except near the apical system, where they are transverse. Paired petals depressed, moderately long, the anterior pair the longer; pores elongated, parallel; interporiferous zones nearly as wide as the poriferous. Peristome far forward, sub-pentagonal, small. Periproct small, higher than wide, near the top of the vertical truncation, barely visible from above. Tubercles widely scattered, larger on the under side.

Length of holotype 40 mm.; width 35 mm.; height 23 mm.

Well-preserved specimens show a fine granulation, which is particularly noticeable in a broad band surrounding the ends of the petals, but there is no fasciole. This granulation is not preserved on the holotype (the locality of which is unknown), but it shows traces of a narrow smooth area suggestive of a peripetalous fasciole.

The preceding description is based on the holotype and other, better-preserved specimens from Texas. The figured specimen from Venezuela is more compressed posteriorly and is somewhat shorter

than the type, but these features can be matched by specimens from the Fredericksburg group of Texas. Three other individuals from Venezuela resemble the holotype in shape but are not well preserved.

Occurrence.—Venezuela: Río Caripe, Monagas (Creole Petroleum Co. 51381).

Geologic horizon.—Early Cretaceous. In Texas the species is abundant in the Goodland limestone, of Albian age.

Figured specimen.—USNM 131171.

CENOZOIC SPECIES

LYTECHINUS VARIEGATUS (Leske)

Pl. 5, figs. 1-2

This common Recent species, which now ranges from North Carolina to Santos, Brazil, is represented by the two fragments figured.

Occurrence.—Venezuela: Río Seco area, Falcon (Creole Petroleum Co. 72466, 72479).

Geologic horizon.—Pliocene: San Gregorio formation.

Figured specimens.—USNM 638624a, b.

PHYMOSOMA TRINITENSIS Cooke, n. sp.

Pl. 2, figs. 1-3

Horizontal outline circular; upper surface slightly inflated; lower surface slightly concave; margin rounded. Apical system wanting; outline pentagonal, the posterior point elongated, the sides weakly fluted. Ambulacra widening regularly to the margin; the first few zygopores uniserial, the later zygopores staggered or biserial to the peristome. Peristome occupying about one-third of the diameter; weakly notched. Primary tubercles smooth, imperforate; two rows in each area. Secondary tubercles scattered over all areas except the median parts of the interambulacral areas near the apex, which are bare.

Diameter of holotype 24 mm.; height 8.7 mm.; diameter of peristome 8.7 mm.

Occurrence.—Trinidad: Marac quarry, M. C. Cater, collector.

Geologic horizon.—Paleocene.

Types.—Holotype, USNM 638643a. Paratype, USNM 638643b.

Comparisons.—This species, which is represented by the holotype and one paratype, closely resembles *Phymosoma hilli* (Clark) (Cooke, 1953, p. 9, pl. 3, figs. 6-7), from which it differs chiefly in the arrange-

ment of the zygopores, which are biserial or staggered throughout in *P. hilli*, uniserial near the apex in *Phymosoma trinitensis*.

OLIGOPYGUS WETHERBYI KUGLERI Jeannet

Pl. 3, figs. 9-11

Oligopygus kugleri Jeannet, 1928, Soc. Paléont. Suisse Mém., vol. 48, pl. 1, figs. 1-7.

Oligopygus kugleri is here treated as a subspecies of *O. wetherbyi* de Loriol (Cooke, 1959, p. 28, figs. 9-12) because all the specimens from Trinidad, 9 entire individuals and several fragments, though variable in proportions, are oval, strongly inflated, and have a smaller peristomial depression than the typical form from Florida. The usual shape of *O. wetherbyi*, as shown by Cooke's figures, is rather low and subpentagonal, though some are regularly oval. All of the rather large suite in the U.S. National Museum are fairly large, and all have a large peristomial depression.

In Cuba, *Oligopygus wetherbyi* tends to be larger than in Florida and even more variable. One long, narrow, very plump variety was described under the name *Oligopygus pinguis* Palmer (MS.) by Sanchez Roig (1949, p. 165, pl. 28, figs. 2-3). A shorter, nearly circular variety from Jamaica has been named *Oligopygus hypselus* Arnold and Clark (1927, p. 29, pl. 4, figs. 9-11). Both of these varieties from Cuba and Jamaica have large peristomial depressions like the typical form from Florida.

Occurrence.—Trinidad: Soldado Rock, Gulf of Paria (Trinidad Petroleum Co. K-903).

Geologic horizon.—Late Eocene: San Fernando formation.

Holotype.—Naturhistorisches Museum, Basel, Switzerland.

Figured specimen.—USNM 638627, a topotype.

OLIGOPYGUS HALDEMANI COSTULIFORMIS Jeannet

Pl. 3, figs. 1-3

Oligopygus cf. *costulatus* (Desor). Jeannet, 1928, Soc. Paléont. Suisse Mém., vol. 48, p. 8, pl. 1, figs. 10-12.

Oligopygus costuliformis Jeannet, 1928, Soc. Paléont. Suisse Mém., vol. 48, p. 9, pl. 1, figs. 13-15.

This subspecies differs from typical *Oligopygus haldemani* (Conrad) as described and figured by Cooke (1959, p. 29, pl. 8, figs. 6-8) in its smaller peristomial depression, which, though deep, is not as conspicuously elongated as that of the typical form from Florida. The only specimen of the subspecies at hand measures 25 mm. in length,

22 mm. in width, and 15 mm. in height. These dimensions fall within the range in size of the typical form, of which a large series is available.

Specimens from Cuba at first identified by Lambert as *Oligopygus wetherbyi* de Loriol and figured under that name by Sanchez Roig (1926, p. 82, pl. 13, figs. 10-11) were later renamed *Oligopygus cubensis* Lambert (1931, Soc. Géol. France Bull., ser. 5, vol. 1, p. 292). This name appears to be a synonym of typical *Oligopygus haldemani* (Conrad).

The most conspicuous difference between *Oligopygus wetherbyi*, the type species of *Oligopygus*, and *O. haldemani* is the location of the periproct. In *O. wetherbyi* it lies midway between the margin and the peristomial depression, in *O. haldemani* closer to the margin. *O. haldemani* is usually the smaller.

Occurrence.—Trinidad: Bella Vista quarry (Mene Grande Oil Co. 19059).

Geologic horizon.—Late Eocene: San Fernando formation.

Holotype.—Naturhistorisches Museum, Basel, Switzerland.

Figured specimen.—USNM 638626, a topotype.

OLIGOPYGUS ROTUNDUS Cooke

Pl. 3, figs. 4-6

?*Oligopygus christi* Jeannet, 1928, Soc. Paléont. Suisse Mém., vol. 48, p. 10, pl. 1, fig. 19; pl. 6, fig. 2. Not pl. 1, figs. 16-18.

Oligopygus rotundus Cooke, 1942, Journ. Paleont., vol. 16, No. 1, p. 9, pl. 2, figs. 1-3.

Oligopygus rotundus Cooke. Cooke, 1959, U. S. Geol. Surv. Prof. Pap. 321, p. 29, pl. 8, figs. 1-5.

Horizontal outline nearly circular; upper surface inflated; lower surface flatter; margin broadly rounded. Apical system central, tumid, monobasal; four genital pores. Petals tumid; paired petals extending more than halfway to the margin, odd petal somewhat longer; poriferous zones narrow, regularly expanding, open distally; pores circular, conjugate. Peristome central, oval, at the bottom of a deep, straight-walled transverse depression occupying less than one-third of the total diameter of the test. Periproct small, round, flush, near the posterior third of the lower side. Tubercles rather large, sunken; intermediate spaces granulated.

Length of holotype 22 mm.; width 20.7 mm.; height 11.2 mm.

Occurrence.—Alabama: Koons Mill on Cripple Creek, Geneva County (holotype).

Trinidad: Bella Vista Road, Mount Moriah, San Fernando (USGS 8879, 9201, J. A. Bullbrook). Point Bontour (Trinidad Oil Co., W. Barr).

Venezuela: Alta Casa Nueva, north of Altagracia de Orituco, Guárico. Bolívar district, Zulia (Creole Petroleum Co. 151007).

Geologic horizon.—Late Eocene: San Fernando formation, Trinidad; Tinajitas formation, Venezuela.

Holotype.—USNM 498991.

Figured specimen.—USNM 638625.

Remarks.—The circular outline of *Oligopygus rotundus* suggests *Oligopygus nancei* Cooke, which has proportionately longer petals, smaller peristomial depression, and more acute margin. *O. nancei* is much larger.

Oligopygus christi Jeannet is based on one corroded, ovate individual from Río Calderas, near Los Baños, Zamoras, Venezuela (the holotype) and one nearly circular fragment from Soldado Rock, Trinidad, which probably represents *Oligopygus rotundus*. The figures do not clearly show the diagnostic features of either specimen. Both are in the Naturhistorisches Museum, Basel, Switzerland.

OLIGOPYGUS NANCEI Cooke

Pl. 2, figs. 10-11

Oligopygus nancei Cooke, 1941, Journ. Paleont., vol. 15, No. 3, p. 305, 3 text figs.
? *Oligopygus circularis* Sanchez Roig, 1949, Los equinodermos fósiles de Cuba, Paleontologia Cubaana, vol. 1, p. 159, pl. 29, figs. 2-3.

Test moderately large; outline subpentagonal to subcircular, widest at the anterior paired ambulacra; about half as high as long; upper surface regularly convex; lower surface nearly flat. Apical system central; four genital pores, widely separated. Petals long, not quite reaching the ambitus, the anterior somewhat longer than the paired petals, straight, open at the distal ends; poriferous zones nearly as wide as the interporiferous zones, slightly curved inward at the tip; pore pairs conjugate; inner pores nearly circular, outer pores elongated; pores at the ends of the plates. Extrapetalous pores in diagonal pairs becoming linear near the peristome. Peristome central, rather small, deeply sunken in a steep-walled, transversely elliptical pit. Periproct round, flush, about one-third the way from the margin to the peristome. Tubercles fairly large, about the same size on top and bottom sides; interscrobicular spaces densely papillated.

Dimensions of holotype and figured paratype: Length 51 and

56 mm.; width 49 and 55 mm.; height (somewhat crushed) 19 and 21 mm.

Occurrence.—Venezuela: Holotype and paratypes from near the headwaters of Río Amana, Anzoátegui, approximately 5 km. southwest of Mundo Nuevo, Monagas (Standard Oil Co. of Venezuela 30123). Río Amana, $3\frac{1}{4}$ km. southwest of Mundo Nuevo, Monagas (Mene Grande Oil Co. A-445). Río Amana, Monagas (Mene Grande Oil Co. A-7532).

Geologic horizon.—Late Eocene: Tinajitas formation.

Holotype and paratype.—USNM 498964.

Remarks.—No authentic specimens of *Oligopygus circularis* are available for comparison, but the description and figures tally with those of *O. nancei*.

HAIMEA OVUM-SERPENTIS (Guppy)

Pl. 4, figs. 7-11

?*Haimca caillaudi* Michelin, 1851, Rev. et Mag. Zool., ser. 2, vol. 3, p. 92, fig. 2.
(Locality unknown.)

Echinolampas ovum-serpentis Guppy, 1866, Geol. Soc. London Quart. Journ., vol. 22, p. 300, pl. 19, figs. 4a-b, 5. Not fig. 6.

Echinolampas ovum-serpentis Guppy. Cotteau, 1875, K. Vetensk.-Akad. Handl., N.F., vol. 13, No. 6, p. 20, pl. 3, figs. 13-21.

Echinolampas ovum-serpentis Guppy. Egozcue y Cía, 1897, Com. Mapa Geol. España Bol., vol. 22, p. 62, pl. 16, figs. 5-9.

Echinolampas ovumserpentis Guppy. Jackson, 1922, Carnegie Inst. Washington Publ. 306, p. 60, pl. 10, figs. 4-5.

"*Echinolampas*" *ovumserpentis* Guppy. Hawkins, 1924, Geol. Mag., vol. 61, p. 318.

?*Pauropygus elevatus* Arnold and Clark, 1927, Harvard Coll. Mus. Comp. Zool. Mem., vol. 50, No. 1, p. 35, figs. 1-3.

Pauropygus ovumserpentis (Guppy). Arnold and Clark, 1927, Harvard Coll. Mus. Comp. Zool. Mem., vol. 50, No. 1, p. 36, pl. 5, figs. 7-12.

?*Haimca caillaudi* Michelin. Arnold and Clark, 1934, Harvard Coll. Mus. Comp. Zool. Mem., vol. 54, No. 2, p. 143.

Haimca ovumserpentis (Guppy). Arnold and Clark, 1934, Harvard Coll. Mus. Comp. Zool. Mem., vol. 54, No. 2, p. 143.

Haimca ovumserpentis (Guppy). Mortensen, 1948, Monograph of the Echinoidea, vol. 4, pt. 1, p. 259.

?*Haimca caillaudi* Michelin. Mortensen, 1948, Monograph of the Echinoidea, vol. 4, pt. 1, p. 258, text figs. 248a-d (after Michelin).

Haimca ovumserpentis (Guppy). Durham and Melville, 1957, Journ. Paleont., vol. 31, No. 1, p. 257, text fig. 2.

Proportions of test variable; horizontal outline usually oval to sub-pentagonal; upper surface evenly inflated or subconical, highest at the apical center; lower surface much flatter, deeply depressed around

the peristome; margin evenly rounded. Apical system central; four genital pores, the anterior pair closer together than the posterior pair; madreporite central. Petals long, extending nearly to the margin, sides straight, wide open at the distal ends; poriferous zones much narrower than the interporiferous; pores circular or oval, conjugate. Extrapetaliferous pores nearly linear except in the peristomial depression, where the two zones are adjacent and the pore pairs are nearly transverse. Peristome central, subquadrate, with shallow notches at the paired ambulacra and a very shallow notch at the anterior ambulacrum. Periproct small, transversely oval or round, flush; near the posterior third of the radius. Tubercles sunken, covering the entire surface except the poriferous zones.

Length of holotype 42 mm.; width 33 mm.; height 18 mm.

Occurrence.—Trinidad: San Fernando (USNM 115389, 115409, R. J. L. Guppy). Bella Vista Road, Mount Moriah, San Fernando (USGS 8878, 9201, J. A. Bullbrook).

Geologic horizon.—Late Eocene: San Fernando formation.

Holotype.—USNM 115392a.

Figured specimens.—USNM 115392a, 115392b, 638628.

Remarks.—Guppy published four figures ostensibly representing *Echinolampas ovum-serpentis*. The original of his figures 4a and 4b, now USNM 115389a, was figured by Jackson (1922, pl. 10, fig. 4) as a cotype. This specimen was selected by H. L. Clark (Arnold and Clark, 1927, p. 36) as the holotype of *Echinolampas ovum-serpentis*, which became the type species of their new genus *Pauropygus*. Guppy's figure 5 is not recognizable. The original of his figure 6 (USNM 115409a, now broken) appears to represent *Oligopygus rotundus* Cooke.

Arnold and Clark (1934, p. 143) reported that their *Pauropygus elevatus* is a synonym of *Haimea caillaudi* Michelin. This identification is open to question because the periproct of *H. caillaudi* is shown in Michelin's drawing (Mortensen, 1948, text fig. 248b) as nearer the peristome, farther from the margin than that of Arnold and Clark's photograph of *Haimea elevata*, which probably is an unusually plump variety of *Haimea ovum-serpentis*. If *Haimea elevata* really is a synonym of *H. caillaudi* and if it represents the same species as *Haimea ovum-serpentis*, then the name *Haimea caillaudi* takes precedence over both.

Haimea ovum-serpentis is abundant in St. Bartholomew and in Jamaica. Egozcue y Cía (1897) and Sanchez Roig (1949, p. 167) report it also from Cuba. Jeannet (1928, p. 12) describes a fragment

of an unidentified species of *Pauropygus* from Ramytrace, Trinidad, and he mentions another from Venezuela.

FIBULARIA FARALLONENSIS Cooke, n. sp.

Pl. 4, figs. 1-6

Horizontal outline subcircular, slightly produced behind. Upper surface hemispherical; lower surface flattened, depressed around the peristome; margin broadly rounded. Apical system obscure. Petals long, straight; poriferous zones diverging; pores circular. Peristome large, central, circular. Periproct smaller, circular; near the posterior third of the radius.

Length of holotype 4.5 mm.; width 4.2 mm.; height 2.9 mm. Length of paratype 5.1 mm.; width 4.8 mm.; height 3.7 mm.

Occurrence.—Trinidad: Farallon Rock, San Fernando (USGS 9199, J. A. Bullbrook).

Geologic horizon.—Middle Eocene: A reef facies of the Navet formation.

Types.—Holotype, USNM 638629a (the smaller specimen); paratype, USNM 638629b.

Comparisons.—*Fibularia farallonensis* is nearly circular in horizontal outline, like *F. texana* (Twitchell) (Cooke, 1959, p. 30, pl. 9, figs. 15-19), and its petals seem to be similar; but its lower surface is flatter and its periproct is nearer the margin. These differences also hold for *Fibularia vauhani* (Twitchell) (Cooke, 1959, p. 30, pl. 9, figs. 23-27) and for *F. alabamensis* (Twitchell) (Cooke, 1959, p. 31, pl. 9, figs. 20-22), both of which, moreover, are conspicuously ovate.

CLYPEASTER ROSACEUS (Linnaeus)

Pl. 5, fig. 3

Echinus rosaceus Linnaeus, 1758, *Systema naturae*, ed. 10, p. 665.

?*Clypeaster cubensis* Cotteau. Egozcue y Cia, 1897, *Com. Mapa Geol. España Bol.*, vol. 22, p. 33, pl. 6, figs. 1-5.

Clypeaster kugleri Jeannet, 1928, *Soc. Paléont. Suisse Mém.*, vol. 48, p. 19, pl. 2, figs. 4-6.

Clypeaster rosaceus (Linnaeus). Mortensen, 1948, *Monograph of the Echinoidea*, vol. 4, pt. 2, p. 40, pl. 1, figs. 2-4; pl. 64, figs. 1-5. Includes additional synonymy.

Clypeaster rosaceus (Linnaeus). Cooke, 1959, *U. S. Geol. Surv. Prof. Pap.* 321, p. 34, pl. 10, figs. 1-3.

Individuals of this common Recent species vary considerably in size and shape and in the width of the opening between the tips of the poriferous zones of the anterior petal. Many are broadly truncated

behind, others are elliptical in horizontal outline, like the type of *Clypeaster kugleri*, which agrees well in such other features as can be determined from the figures. There is some variation also in the degree of swelling of the interporiferous zones. The wide petals with strongly incurved tips are characteristic.

Occurrence.—Venezuela: Goajira Peninsula, Zulia (Creole Petroleum Co. 13418). Near Castilletes, Goajira Peninsula (Creole Petroleum Co. 81046). Quebrado Cojoro, Goajira Peninsula, Paez district, Zulia (B-2305). Punta Carnero, Isla Margarita (Creole Petroleum Co. 79055). Río Motoruco, La Vela de Coro, Falcon (B-2771). Río Coro, Falcon (Creole Petroleum Co. 56929). Near southwest edge of Cumarebo field, Falcon (Creole Petroleum Co. 59953).

Geologic horizon.—Miocene to Recent.

Figured specimen.—USNM 638630 (Creole Petroleum Co. 13418).

ENCOPE MICHELINI Agassiz

Pl. 6, figs. 5-6; pl. 7, fig. 5

Encope michelini Agassiz, 1841, Monographies d'échinodermes, Monogr. 2, p. 58, pl. 6a, figs. 9-10.

?*Encope platytata* Jackson, 1917, Proc. U. S. Nat. Mus., vol. 53, No. 2218, pl. 67, figs. 1-2, text fig. 2.

Encope wiedenmayeri Jeannel, 1928, Soc. Paléont. Suisse Mém., vol. 48, p. 20, pl. 3, figs. 1-4, text fig. 3.

Encope michelini Agassiz. Cooke, 1959, U. S. Geol. Surv. Prof. Pap. 321, p. 49, pl. 18, figs. 2-3.

This common Recent species is variable in many features, notably the height of the posterior part, which ranges from slightly higher than the apical system to a protruding hump; the depth of the ambulacral emarginations; the size and shape of the posterior lunule, which ranges from circular to much elongated; and the shape of the petals, which in young individuals are more convex than when full grown.

A single fragment from the Gatun formation of the Canal Zone, the holotype of *Encope platytata* Jackson, has convex poriferous zones of the anterior paired petals much like those of the small Recent specimen figured by Cooke (1959), but the discovery of topotypes may show it to be different.

There seems to be no doubt that the many *Encopes* in the collections from Venezuela here studied represent the same species as the two fragments named *Encope wiedenmayeri* by Jeannel. Most of them fall within the range of variation of *Encope michelini*, but some of the fossils are larger than the living form. One fossil from

near Cumaná, Sucre (Creole Petroleum Co. 8270), is nearly twice as large as the one from Sucre figured here. All are somewhat higher behind the apical system than in front; a few are conspicuously higher.

Occurrence.—Venezuela: Boca de Güeque, Falcon (*E. wiedenmayeri* Jeannet, *vide* Jeannet). Güeque area, Falcon (Creole Petroleum Co. 11050). Sucre (Creole Petroleum Co. 8286, 8298). Near Cumaná, Sucre (Creole Petroleum Co. 8270).

Geologic horizon.—Miocene to Recent: "Couches d'Ojo de Agua," of middle Miocene age (*vide* Jeannet). San Gregorio formation, of Pliocene age.

Figured specimen.—USNM 638631, from the San Gregorio formation.

ENCOPE KUGLERI Jeannet

Pl. 10, fig. 1

Encope kugleri Jeannet, 1928, Soc. Paléont. Suisse Mém., vol. 48, p. 23, pl. 3, figs. 5-6; text figs. 4-6.

This species, represented by several fragments, seems to be nearly equidimensional in horizontal directions. It has five fairly deep ambulacral notches. The posterior petals are somewhat longer than the others. The posterior lunule in the figured specimen is narrower than that shown in Jeannet's type, and its rim is raised. It lies between the tips of the petals and extends nearly halfway to the center.

Occurrence.—Venezuela: La Jovita de Candado, near Mirimire, Falcon (type, *vide* Jeannet). Río Seco area, Falcon (Creole Petroleum Co. 72709, 72716, 72912).

Geologic horizon.—Miocene: Capadare limestone, of middle Miocene age (*vide* Jeannet). Chiguaje formation, of late Miocene age.

Figured specimen.—USNM 638632.

ENCOPE SECOENSIS Cooke, n. sp.

Pl. 8, fig. 1; pl. 9, figs. 1-2

Horizontal outline ovate, very slightly longer than wide, widest point behind the middle, flattened behind; highest point anterior; margin thin. Five ambulacral notches showing a tendency to close. Posterior lunule elongated, narrow; extending anterior to the distal tips of the adjacent petals; rim very slightly raised. Apical system slightly anterior, star shaped, with five genital pores. Posterior petals the longest, anterior paired petals the shortest; all petals open distally; poriferous zones curved, those of the anterior paired petals

evenly curved, those of the other petals incurved near the distal tips. Peristome under the apical system. Periproct elongated, closer to the lunule than to the peristome.

Length of holotype 109 mm.; width 105 mm.; height 12 mm.

Occurrence.—Venezuela: Río Seco area, Falcon (Creole Petroleum Co. V-2635, 72466 (holotype), 72468 (paratypes), 72480, 72482).

Geologic horizon.—Pliocene: San Gregorio formation. One lot from the Miranda district is referred by the label to the Codore formation, another to the Chiguaje formation, both of late Miocene age.

Comparisons.—The petals of *Encope secoensis* resemble those of *Encope micropora* Agassiz (1841, p. 50, pl. 10a, figs. 4-8; pl. 19a, fig. 7), but its ambulacral notches are usually open, like those of *Encope emarginata* (Leske) (Cooke, 1959, p. 49, pl. 17, fig. 5; pl. 18, fig. 1), which, however, is highest behind. *Encope secoensis* appears to be closely related to *E. sverdrupi* Durham (1950, p. 48, pl. 37, fig. 6; pl. 39, figs. 4, 6), from the lower Pliocene of Santa Inez Bay, Baja California, but the petals of the holotype of that species are less broadly rounded. This may be an individual feature, for there is some variation in the curvature of *E. secoensis*, some of whose petals approximate the shape of *E. sverdrupi*.

ENCOPE (MELITELLA) FALCONENSIS Cooke, n. sp.

Pl. 8, figs. 2-4

Horizontal outline subcircular, truncated behind. Highest point central. Apical system central, star shaped, rather large; five genital pores. Petals short, nearly equal in length, extending halfway to the margin; half as wide as long; poriferous zones evenly rounded; inner pores circular, outer pores elongated, diagonal. Ambulacral notches closed in the type, open in smaller individuals. Posterior lunule oval, near the margin. Peristome small, central, pentagonal. Periproct elongated, midway between the peristome and the margin. Ambulacral grooves conspicuous.

Length of holotype 61 mm.; width 63 mm.; height 9 mm.

Occurrence.—Venezuela: Río Seco area, Falcon (Creole Petroleum Co. V-2651, 72465, 72473, 72715 (holotype)).

Geologic horizon.—Miocene and Pliocene: Chiguaje formation, of late Miocene age (type). San Gregorio formation, of Pliocene age.

Holotype.—USNM 638633.

Comparison.—This species appears to resemble *Encope (Melitella) stokesii* Agassiz (1841, p. 59, pl. 6a, figs. 1-8), living off the Galápagos and along the west coast of tropical America, and may prove to be the

same. No authentic specimens of *E. stokesii* are available for comparison. Agassiz's figures are similar, but according to Mortensen (1928-1951, vol. 4, pt. 2, p. 449) "the apical system and the vertex are posterior as in *Dendraster excentricus*" though less so, and the posterior petals are correspondingly shorter. The apical star of *Encope falconensis* seems to be larger than that of *E. stokesii*.

WEISBORDELLA MIRABILIS (Jackson)

Pl. 3, figs. 7-8

Horizontal outline subpentagonal; lateral profile straight below, arched centrally above; upper surface tumid medially; lower surface very slightly concave; margin acutely rounded. Apical system nearly central; four widely spaced small genital pores, the anterior pair closer together than the posterior pair; a few scattered hydropores. Petals extending about two-thirds the way to the margin, the anterior pair somewhat shorter than the others; poriferous zones of nearly even width, narrower than the widest part of the interporiferous zones, plainly open apically, nearly closed distally, inner pores circular, outer pores slightly elongated; interporiferous zones lanceolate. Peristome central, small, pentagonal. Periproct small, circular, near the posterior fourth of the radius. Small tubercles and granules cover all the test except the poriferous zones; two large sunken tubercles between the lateral petals and one in each anterior interambulacral area.

Occurrence.—Trinidad: Bella Vista Road, Mount Moriah, San Fernando (USGS 8878, J. A. Bullbrook).

Geologic horizon.—Late Eocene: San Fernando formation.

Types.—Holotype, USNM 328247; paratype, USNM 328248.

Remarks.—*Weisbordella mirabilis* closely resembles *W. johnsoni* (Twitchell) (Cooke, 1959, p. 54, pl. 20, figs. 5-7), from which it differs in having six large tubercles and in the location of its periproct, which is somewhat nearer the margin than is customary in *Weisbordella johnsoni*. The occurrence of large tubercles may be a variable feature, as in *Weisbordella cubae* (Weisbord) (Cooke, 1959, p. 53, pl. 20, figs. 1-4), and the distance of the periproct from the margin may vary with the shape of the test. As the types are the only representatives thus far discovered, the range of variability is unknown.

CASSIDULUS (CASSIDULUS) FALCONENSIS (Jeannet)

Pl. 14, figs. 5-8

Eurhodia falconensis Jeannet, 1928, Soc. Paléont. Suisse Mém., vol. 48, p. 32, pl. 4, figs. 2-7; pl. 6, fig. 7; text fig. 10.

Four specimens of this species from the Naturhistorisches Museum of Basel have been available for study. The species is not an *Eurhodia* as interpreted by Cooke (1959, p. 63), for its peristome is transversely elongated and its periproct is flush.

Like most species of *Cassidulus*, *C. falconensis* varies considerably in proportions. These specimens are low, and their margins are acute, as in *Cassidulus gouldii* (Bouvé) (Cooke, 1959, p. 57, pl. 24, figs. 5-12), a species common in Oligocene deposits of the United States, but its petals are longer. The petals are similar to those of *Cassidulus sabistonensis* Kellum (Cooke, 1959, p. 57, pl. 23, figs. 6-14) from the late Miocene of Florida and the Carolinas, but its test is much lower and its margin much more acute.

Occurrence.—Venezuela: Punta Gavilan, Falcon.

Geologic horizon.—Middle Miocene: Upper part of the "couches d'Ojo de Agua" (*vide* Jeannet).

Holotype.—Naturhistorisches Museum, Basel, Switzerland.

Figured specimen.—USNM 638635.

ECHINOLAMPAS LYCOPERSICUS Guppy

Pl. 9, figs. 3-5

Echinolampas lycopersicus Guppy, 1866, Geol. Soc. London Quart. Journ., vol. 22, p. 300, pl. 19, fig. 8.

Echinolampas lycopersicus Guppy. Cotteau, 1875, K. Svenska Vetensk.-Akad. Handl., vol. 13, No. 6, p. 21, pl. 3, figs. 22-26.

Echinolampas anguillae Cotteau, 1875, K. Svenska Vetensk.-Akad. Handl., N.F., vol. 13, No. 6, p. 24, pl. 4, figs. 5-8.

Echinolampas lycopersicus Guppy. Cotteau, 1881, Soc. Géol. Belgique Ann., vol. 9, p. 20.

Echinolampas lycopersicus Guppy. Egozcue y Cía, 1897, Com. Mapa Geol. España Bol., vol. 22, p. 59, pl. 19, figs. 1-3 (after Cotteau).

Echinolampas lycopersicus Guppy. Jackson, 1922, Carnegie Inst. Washington Publ. 306, p. 64, pl. 11, figs. 3-6.

Echinolampas anguillae Cotteau. Jackson, 1922, Carnegie Inst. Washington Publ. 306, p. 66, pl. 11, figs. 7-9.

Echinolampas lycopersicus Guppy. Arnold and Clark, 1927, Harvard Coll. Mus. Comp. Zool. Mem., vol. 50, No. 1, p. 50.

?*Echinolampas* sp. Jeannet, 1928, Soc. Paléont. Suisse Mém., vol. 48, p. 35, text fig. 11.

Horizontal outline ovate; upper surface variably inflated; lower surface flattish, slightly depressed around the peristome; margin broadly rounded. Apical system small; four genital pores; slightly anterior. Petals extending nearly to the margin, open distally, posterior pair the longest; poriferous zones curved, narrow, posterior zone of anterior pair longer than the others; pores conjugate, inner pores circular, outer pores elongated; interporiferous zones much wider than the poriferous. Peristome directly beneath the apical system, large, pentagonal, transversely elongated; floscelle distinct; bourrelets swollen. Periproct submarginal, not visible from above, transversely elongated. Tubercles small, depressed, closely covering the entire test except the poriferous zones.

Length of figured specimen 53.7 mm.; width 47.6 mm.; height 24 mm.

Occurrence.—Trinidad: Morne Diablo quarry (Creole Petroleum Co. 19070).

Venezuela: Bejuco, Araurima Valley, Acosta district, Falcon.

Geologic horizon.—Middle Miocene: The species was described from the Anguilla formation of Anguilla, B.W.I.

Cotypes.—Six specimens, USNM 115388, one of which was figured by Guppy. Holotype of *Echinolampas anguillae* USNM 115372.

Figured specimen.—USNM 115387a, one of three collected by Guppy but probably not in his original lot. This specimen was figured also by Jackson, another by Cotteau.

Remarks.—*Echinolampas lycopersicus* has been found also in Puerto Rico, Cuba, and Jamaica. It varies considerably in size and degree of inflation, but the shape of the petals is relatively constant. The specimens from Trinidad and Venezuela are much more highly inflated than the one figured from Anguilla, but others from Anguilla are equally inflated.

The holotype of *Echinolampas anguillae* is a unique specimen which has been compressed laterally, making it proportionally narrower and subconical, and giving a specious concavity to its lower surface. Guppy (1879, p. 196), too, regarded it as an unusual form of *Echinolampas lycopersicus*.

MOIRA ATROPOS (Lamarck)

Pl. 6, figs. 1-4

Spatangus atropos Lamarck, 1816, Histoire naturelle des animaux sans vertèbres, vol. 3, p. 32.

Moiria atropos (Lamarck). Cooke, 1959, U. S. Geol. Surv. Prof. Pap. 321, p. 73, pl. 30, figs. 1-4.

Three large, imperfect specimens certainly represent the genus *Moiria* and probably this species, which is widely distributed in the Atlantic Ocean and in the Gulf of Mexico. The largest measures 55 mm. in length, 45 mm. in width, and 29 mm. in height.

Occurrence.—Venezuela: Río Seco area, Falcon (Creole Petroleum Co. V-2677, 72537).

Geologic horizon.—Pliocene: San Gregorio formation. Also Recent.

Figured specimen.—USNM 638637.

AGASSIZIA SCROBICULATA Valenciennes

Pl. 5, figs. 4-7

Agassizia scrobiculata Valenciennes, 1846, Voyage de la Frégate *Venus*, pl. 1, fig. 2.

Agassizia scrobiculata Valenciennes. A. Agassiz, 1872-1874, Harvard Coll. Mus. Comp. Zool. Mem., vol. 3, pp. 85, 594, pl. 19a, figs. 1-3; pl. 19b, figs. 1-3.

Agassizia scrobiculata Valenciennes. Grant and Hertlein, 1938, California Univ. (Los Angeles) Publ. in Math. Phys. Sci., vol. 2, p. 114, pl. 29, figs. 2-3; pl. 30, fig. 12; text fig. 10 (after Valenciennes).

Agassizia scrobiculata Valenciennes. Mortensen, 1951, Monograph of the Echinoidea, vol. 5, pt. 2, p. 342, pl. 19, figs. 4, 10, 11; pl. 55, figs. 1-4, 7, 10, 13, 15. Includes additional synonymy.

Test subglobular; horizontal outline steeply sloping in front of the apex, more openly curved behind. Apical system anteriorly eccentric, ethmolytic; four genital pores when mature. Petals widely spreading; anterior pair longer than the posterior, pores of anterior row very small and inconspicuous; posterior pair fairly long, well developed. Peristome at the anterior third. Periproct transversely oval; near the top of a posterior truncation, which curves forward near the bottom. Marginal fasciole extending downward in a V-shaped projection below the periproct. Lateral fascioles uniting behind the posterior petals.

Occurrence.—Venezuela: Río Seco area, Falcon (Creole Petroleum Co. 2630, 2632, 72479 (figured)).

Geologic horizon.—Pliocene: San Gregorio formation. Also Recent.

Figured specimen.—USNM 638636.

Remarks.—There are no apparent differences between these Pliocene forms from Venezuela and Recent specimens from the Gulf of California, with which they have been compared. Grant and Hertlein

(1938) record the species also from the Pliocene at Santa Inez Point on the east coast of Baja California.

ANTILLASTER LAMBERTI Jeannet

Pl. 11, figs. 1-2

Antillaster lamberti Jeannet, 1928, Soc. Paléont. Suisse Mém., vol. 48, p. 36, pl. 4, figs. 14-15.

Horizontal outline cordate, widest in front of the center; lateral profile strongly inflated above, nearly flat beneath, anterior slope the steeper; transverse profile nearly semicircular. Apical system somewhat anterior, at the highest point; three genital pores, the right anterior pore not developed. Anterior ambulacrum not petaloid, narrow, in a shallow depression, which is deepest at the margin. Anterior paired petals widely diverging, slightly curved forward, open distally, extending more than halfway down the lateral slopes; pores conjugate, outer pores elongated, inner pores circular; interporiferous zones much wider than the poriferous. Posterior petals somewhat longer than the anterior pair, straight. Peristome surrounded by a floscelle, wider than long, strongly lipped, at the anterior fifth, in a deep transverse depression, which covers more than half the width of the test. Periproct submarginal, not visible from above; on a concave truncation, which slopes downward and forward. Tubercles perforated, larger on the bottom, evenly scattered. No fascioles visible.

Length of largest of four specimens 103 mm.; width 99 mm.; height 75 mm.

Occurrence.—Venezuela: Sabanas Altas, Falcon (type, *fide* Jeannet). La Vigía, 10 km. southwest (southeast?) of Pueblo Nuevo, Paraguaná district, Falcon (Creole Petroleum Co. 7824). Cerro La Luz near Quebrada Larga, 3 km. west of Pueblo Nuevo (Mene Grande Petroleum Co. B-6295).

Geologic horizon.—Miocene: Upper part of the "couches d'Ojo de Agua" (type, *fide* Jeannet). La Vela formation, of late Miocene age.

Figured specimen.—USNM 638639, from La Vigía.

Remarks.—*Antillaster lamberti* shows considerable variation in the degree of inflation and in the depth of the anterior emargination. The periproct of the figured specimen is somewhat distorted; it may originally have been pear shaped.

PERICOSMUS STEHLINI Jeannet

Pl. 13, figs. 3-6

Pericosmus stehlini Jeannet, 1928, Soc. Paléont. Suisse Mém., vol. 48, p. 43, pl. 4, figs. 21-24.

Horizontal outline subovate, emarginate in front, truncated behind; upper surface inflated; lateral profile highest near the front, steeply curved downward in front, more gently behind, nearly straight below. Apical system slightly anterior; three genital pores, the right anterior pore wanting; ethmolytic. Anterior ambulacrum not at all petaloid; moderately depressed, the depression extending the full length, weakest near the peristome. Paired petals deeply sunken, widely spreading, the anterior pair the longest, extending nearly to the margin; poriferous zones wider than the interporiferous; inner pores circular, outer pores somewhat elongated; pores conjugate. Peristome near the anterior fifth, semilunate, weakly lipped. Periproct broadly oval, transverse; at the top of the posterior truncation; slightly overhanging. Peripetalous fasciole deeply indented in the posterior and interambulacral areas. Marginal fasciole slightly undulate, curved down under the periproct. Tubercles of medium size, somewhat smaller on the top.

Length of figured specimen 56 mm.; width 54.5 mm.; height 37 mm. Another specimen measures 66 by 60 by 41 mm.

Occurrence.—Venezuela: Coro, Falcon (type, *vide* Jeannet). La Vigía, 10 km. southwest (southeast?) of Pueblo Nuevo, Paraguaná district, Falcon (Creole Petroleum Co. 7824).

Geologic horizon.—Miocene: Probably "Damsite series," of middle (?) Miocene age (type, *vide* Jeannet). Le Vela formation, of late Miocene age.

Holotype.—Naturhistorisches Museum, Basel, Switzerland.

Figured specimen.—USNM 638638. From La Vigía.

LOVENIA cf. L. DUMBLEI Kew

Pl. 13, fig. 2

Cf. *Lovenia dumblei* Kew, 1917, California Acad. Sci. Proc., ser. 4, vol. 7, No. 5, p. 136, pl. 17, figs. 2a-c.

One defective *Lovenia* should be compared with *Lovenia dumblei* Kew from the Miocene (?) of Mexico at Rancho Nuevo, 35 km. northwest of Tuxpan. It is proportionately longer and narrower than the holotype as figured by Kew (fig. 2a) and differs further in that

the proximal end of the anterior poriferous zone of the anterior paired petals is straight, not curved forward. This may be an individual variation, for the zone of the paratype (Kew's figure 2b) appears to be straight.

The distribution of the tubercles is similar to that of *Lovenia dumblei* but differs from that of *Lovenia alabamensis* Cooke (1959, p. 77, pl. 32, figs. 14-17) from the Chickasawhay limestone of Alabama in that its tubercles extend farther back. The shape of the poriferous zones is like that of *L. alabamensis*.

Occurrence.—Venezuela: Punta Gavilan, Falcon.

Geologic horizon.—Miocene.

Figured specimen.—Naturhistorisches Museum, Basel, Switzerland.

EUPATAGUS CLEVEI (Cotteau)

Pl. 10, figs. 2-5

Euspatangus clevei Cotteau, 1875, K. Svenska Vetensk.-Akad. Handl., N.F., vol. 13, No. 6, p. 44, pl. 8, figs. 1-4.

Euspatangus grandiflorus Cotteau, 1875, K. Svenska Vetensk.-Akad. Handl., N.F., vol. 13, No. 6, p. 45, pl. 8, figs. 5-6.

Eupatagus clevei (Cotteau). Guppy, 1879, Sci. Assoc. Trinidad Proc., vol. 2, pt. 12, p. 109.

Eupatagus grandiflorus (Cotteau). Jackson, 1922, Carnegie Inst. Washington Publ. 306, p. 89, pl. 15, figs. 5-6.

Eupatagus clevei (Cotteau). Jackson, 1922, Carnegie Inst. Washington Publ. 306, p. 90, pl. 16, figs. 1-2.

Eupatagus grandiflorus (Cotteau). Molengraaff, 1929, Geologie en geohydrologie het eiland Curaçao, p. 72, pl. 24, figs. 1-2; pl. 25, fig. 1.

Eupatagus grandiflorus (Cotteau). Arnold and Clark, 1934, Harvard Coll. Mus. Comp. Zool. Mem., vol. 54, No. 2, p. 156.

Eupatagus clevei (Cotteau). Cooke, 1948, Journ. Paleont., vol. 22, No. 1, pl. 22, fig. 9.

Eupatagus clevei (Cotteau). Fischer, 1951, Florida Geol. Surv. Bull. 34, pt. 2, p. 83, pl. 7, figs. 1-3; text fig. 18.

Eupatagus clevei (Cotteau). Cooke, 1959, U. S. Geol. Surv. Prof. Pap. 321, p. 89, pl. 41, figs. 6-8.

This large swollen *Eupatagus* is represented in the collections from Venezuela by one slightly crushed individual whose lower surface is covered by hard matrix and whose upper surface is badly corroded. It measures 64 mm. in length by about 53 mm. in width.

The types of *Eupatagus clevei* (refigured here) and *E. grandiflorus* (a synonym) were found in the Eocene of St. Bartholomew. The species later came to light in Curaçao, Jamaica, Panama, and Florida.

Occurrence.—Venezuela: San Mateo, Lara (Creole Petroleum Co. 99004).

Geologic horizon.—Late Eocene.

Holotype.—USNM 115379.

BRISSUS UNICOLOR (Leske)

Pl. 7, figs. 1-4

Spatangus brissus var. *unicolor* Leske, 1778, Klein's Naturalis dispositio echinodermatum, p. 248, pl. 26, figs. B-C.

Brissus exiguus Cotteau, 1875, K. Svenska Vetensk.-Akad. Handl., N.F. vol. 13, No. 6, p. 35, pl. 6, figs. 16-18.

Brissus exiguus Cotteau. Jackson, 1922, Carnegie Inst. Washington Publ. 306, p. 87, pl. 15, figs. 2-4.

Brissus unicolor (Leske). Cooke, 1959, U. S. Geol. Surv. Prof. Pap. 321, p. 81, pl. 36, figs. 1-4.

This well-known Recent species is represented by one fairly well preserved specimen and one fragment. They are remarkably similar to Recent specimens of the same size from Haiti, from which they differ in the apparently farther forward location of the apical system, which has been foreshortened by slight crushing, which also has deepened the anterior paired petals. The apical system and the lower margin of the peristome are wanting. The peripetalous and subanal fascioles are like those of the Recent species.

Brissus exiguus Cotteau, from the Miocene of Anguilla, seems to be this same species. The holotype (USNM 115396) is a juvenile with only three genital pores. Its left side and base have been crushed.

Occurrence.—Trinidad: Savanetta, near Gran Couva (Trinidad Oil Co. 254677).

Geologic horizon.—Late Miocene: Springvale formation.

Figured specimen.—USNM 638641.

BRISSOPSIS ANTILLARUM Cotteau

Pl. 12, figs. 1-4

Brissopsis antillarum Cotteau, 1875, K. Svenska Vetensk.-Akad. Handl., N.F., vol. 13, No. 6, p. 37, pl. 6, figs. 19-25.

Brissopsis antillarum Cotteau. Jackson, 1922, Carnegie Inst. Washington Publ. 306, p. 82, pl. 14, figs. 3-4.

Horizontal outline subovate, notched in front, truncated behind. Apical system slightly anterior; four genital pores; ethmolytic. Anterior ambulacrum strongly depressed on upper surface, slightly notching the margin, almost flat on lower surface; paired pores sepa-

rated by a bead. Anterior paired petals depressed, widely spreading, extending three-fourths of the way to the margin, wide; anterior pores much reduced near the apical system. Posterior petals depressed, longer than the anterior pair, adjacent and confluent near the apical system, spreading apart distally; pores large, oval. Peristome near the anterior quarter, strongly lipped. Periproct vertically elongated, near the top of a posterior truncation. Peripetalous fasciole deeply indented except in front; subanal fasciole reniform.

Length of largest cotype (from Antigua) 47 mm.; width 38 mm.; height about 18 mm. Length of figured specimen (from Venezuela) 62 mm.; width 47 mm.; height 23 mm.

Occurrence.—Venezuela: Paraguaná Peninsula 10 km. southeast of Pueblo Nuevo, Falcon (Creole Petroleum Co. 7824).

Geologic horizon.—Miocene: La Vela formation, of late Miocene age. The types are from the Anguilla formation, of middle Miocene age.

Cotypes.—USNM 115406.

Figured specimen.—USNM 638640.

PLAGIOBRISUS GRANDIS (Gmelin)?

Pl. 13, fig. 1

Echinus grandis Gmelin, 1791, Linné, Systema naturae, vol. 1, pt. 6, p. 3200.

Plagiobrissus grandis (Gmelin). Mortensen, 1951, Monograph of the Echinoidea, vol. 5, pt. 2, p. 496, pls. 40-41; pl. 63, figs. 13, 16.

Plagiobrissus grandis (Gmelin). Cooke, 1959, U. S. Geol. Surv. Prof. Pap. 321, p. 86, pl. 39, figs. 1-2; pl. 40, fig. 6.

One fragment showing most of the right posterior quadrant of the upper surface, most of the escutcheon and subanal fasciole, and part of the lateral lower surface agrees in all recognizable features with the Recent *Plagiobrissus grandis* of the West Indian region. The escutcheon is semicircular in front, like the Recent species, differing in this respect from *Plagiobrissus lamberti* Jeannet (1928, p. 38, pl. 5, figs. 1-2; pl. 6, figs. 13-14; text fig. 12) from the "couches d'Ojo de Agua" on the road from Guaidima to Riecito (Falcon) as figured by Jeannet, which is pointed.

Occurrence.—Venezuela: Paraguaná Peninsula 10 km. southeast of Pueblo Nuevo, Falcon (Creole Petroleum Co. 7824).

Geologic horizon.—Miocene?

Figured specimen.—USNM 638642.

RHYNObRISSUS ROSTRATUS Cooke, n. sp.

Pl. 14, figs. 1-4

Horizontal outline pointed ovate, strongly rostrate behind; lateral profile narrowly wedge shaped, highest behind; posterior end sloping downward and forward at an angle approximating 45° . Apical system somewhat anterior, not preserved (the genus has four genital pores, the posterior pair separated by the protruding madreporite). Anterior ambulacrum flush, not at all petaloid. Petals depressed; anterior pair forming a straight line, extending about three-fourths the way to the margin, the anterior half much reduced in width near the apical system; posterior petals longer, straight, not widely diverging; pores oval. Peristome anterior, strongly lipped. Periproct bilunate, transversely elongated, high on the rostrate end. Peripetalous fasciole strongly depressed; slightly reentrant between the lateral petals. Subanal and circumanal fascioles connected, forming a figure 8. Tubercles small, close set and granular on the upper surface, larger and farther apart on the lower surface.

Length 51.4 mm.; width 37.3 mm.; height 24.5 mm.

Occurrence.—Venezuela: Punta Gavilan, Falcon.

Geologic horizon.—Miocene?: Probably from the La Vela formation, of late Miocene age.

Holotype.—Naturhistorisches Museum, Basel, Switzerland.

Comparison.—The unique type of this species is somewhat distorted by crushing. It most closely resembles *Rhynobrissus cuneus* Cooke (1959, p. 88, pl. 36, figs. 7-11), living off the coast of North Carolina. It differs from *R. cuneus* as follows: Its anterior petals are more widely diverging. Its posterior end is narrower, more rostrate, more strongly overhanging. Its plastron is more protruding and less nearly elliptical. Its periproct is nearer the junction of the anal and circumanal fascioles, and its peripetalous fasciole is somewhat indented. Some of these differences may be the result of distortion, the others possibly are individual variations. If so, this species will fall into the synonymy of *Rhynobrissus cuneus*.

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EXPLANATION OF PLATES

PLATE 1

Figs. 1-4. *Enallaster bravocensis* Böse (p. 7).

Top, posterior-end, bottom, and right-side views $\times 1$ of USNM 131170. From the Cogollo limestone, of Early Cretaceous age, at Río Socuy, Zulía, Venezuela.

Figs. 5-9. *Hemiasster* sp. (p. 8).

Top, right-side, left-side, posterior-end, and bottom views $\times 1$ of USNM 131168. From beds of Early Cretaceous age in the State of Monagas, Venezuela.

Figs. 10-12. *Phyllobrissus zulianus* Cooke, n. sp. (p. 6).

Top, right-side, and bottom views $\times 1$ of holotype, USNM 131167. From the Apón formation, of Aptian age, at Roas Island, Zulía, Venezuela.

PLATE 2

Figs. 1-3. *Phymosoma trinitensis* Cooke, n. sp. (p. 10).

Top view $\times 2$ and bottom and left-side views $\times 1$ of holotype, USNM 638643a. From the Marac formation, of Paleocene age, in the Marac quarry, southern Trinidad.

Figs. 4-5. *Holcetypus planatus apouensis* Cooke, n. subsp. (p. 6).

Top and left-side views $\times 1$ of holotype, USNM 131169. From the Capacho formation, of Early Cretaceous age, at Río Apón, Zulía, Venezuela.

Figs. 6-9. *Epiaster whitei* Clark (p. 9).

Top, posterior-end, left-side, and bottom views $\times 1$ of USNM 131171. From rocks of Early Cretaceous age on Río Caripe, Monagas, Venezuela.

Figs. 10-11. *Oligopygus nancei* Cooke (p. 13).

Top view of holotype and bottom view $\times 1$ of paratype, USNM 498964. From the Tinajitas formation, of late Eocene age, near the headwaters of Río Amana, Anzoátegui, Venezuela, approximately 5 km. southwest of Mundo Nuevo, Monagas.

PLATE 3

- Figs. 1-3. *Oligopygus haldemani costuliformis* Jeannet (p. 11).
Top view $\times 1\frac{1}{2}$ and bottom and right-side views $\times 1$ of USNM 638626. From the San Fernando formation, of late Eocene age, at the Bella Vista quarry, Trinidad.
- Figs. 4-6. *Oligopygus rotundus* Cooke (p. 12).
Top and bottom views $\times 2$ and right-side view $\times 1$ of USNM 638625. From the Tinajitas formation, of late Eocene age, at Alta Casa Nueva, north of Altagracia de Orituco, Guárico, Venezuela.
- Figs. 7-8. *Wcisbordella mirabilis* (Jackson) (p. 20).
Top view $\times 2$ and bottom view $\times 1$ of holotype, USNM 328247. From the San Fernando formation, of late Eocene age, on the Bella Vista Road, Mount Moriah, San Fernando, Trinidad (USGS 8878).
- Figs. 9-11. *Oligopygus wetherbyi kugleri* Jeannet (p. 11).
Top view $\times 1\frac{1}{2}$ and bottom and left-side views $\times 1$ of USNM 638627. From the San Fernando formation, of late Eocene age, at Soldado Rock, Trinidad.

PLATE 4

- Figs. 1-6. *Fibularia farallonensis* Cooke, n. sp. (p. 16).
1-3, Top, left-side, and bottom views $\times 5$ of holotype, USNM 638629a.
4-6, Top, left-side, and bottom views $\times 5$ of paratype, USNM 638629b.
From a reef facies of the Navet formation, of middle Eocene age, on Farallon Rock, near San Fernando, Trinidad (USGS 9199).
- Figs. 7-11. *Haimea ovum-serpentis* (Guppy) (p. 14).
7, Top view $\times 1$ of USNM 115392a.
8, Bottom view $\times 1$ of USNM 115392b.
From the St. Bartholomew limestone, of late (?) Eocene age, on St. Bartholomew, B.W.I.
9-11, Top and bottom views $\times 1\frac{1}{2}$ and right-side view $\times 1$ of USNM 638628.
From the San Fernando formation, of late Eocene age, on Bella Vista Road at Mount Moriah, near San Fernando, Trinidad (USGS 8878).

PLATE 5

- Figs. 1-2. *Lytechinus variegatus* (Leske) (p. 10).
1, Bottom view $\times 1$ of USNM 638624a.
2, Top view $\times 1$ of USNM 638624b.
From the San Gregorio formation, of Pliocene age, in the Río Seco area, Falcon, Venezuela.
- Fig. 3. *Clypeaster rosaceus* (Linnaeus) (p. 16).
Top view $\times 1$ of USNM 638630. From beds of Miocene age in the Goajira Peninsula, Zulia, Venezuela.

- Figs. 4-7. *Agassizia scrobiculata* Valenciennes (p. 23).
Top, bottom, left-side, and posterior-end views $\times 1$ of USNM 638636. From the San Gregorio formation, of Pliocene age, in the Río Seco area, Falcon, Venezuela.

PLATE 6

- Figs. 1-4. *Moiria atropos* (Lamarck) (p. 22).
Top, anterior-end, posterior-end, and bottom views $\times 1$ of USNM 638637. From the San Gregorio formation, of Pliocene age, in the Río Seco area, Falcon, Venezuela.
- Figs. 5-6. *Encope michelini* Agassiz (p. 17).
Top and right-side views of USNM 638631. Probably from the San Gregorio formation, of Pliocene age, in Sucre, Venezuela.

PLATE 7

- Figs. 1-4. *Brissus unicolor* (Leske) (p. 27).
Top, right-side, posterior-end, and bottom views $\times 1$ of USNM 638641. From the Springvale formation, of late Miocene age, of Savanetta, near Gran Couva, Trinidad.
- Fig. 5. *Encope michelini* Agassiz (p. 17).
Bottom view $\times 1$ of USNM 638631. Probably from the San Gregorio formation, of Pliocene age, in Sucre, Venezuela.

PLATE 8

- Fig. 1. *Encope secoensis* Cooke, n. sp. (p. 18).
Top view $\times 1$ of holotype, USNM 638634. From the San Gregorio formation, of Pliocene age, in the Río Seco area, Falcon, Venezuela.
- Figs. 2-4. *Encope (Melitella) falconensis* Cooke, n. sp. (p. 19).
Top, bottom, and right-side views $\times 1$ of holotype, USNM 638633. From the Chiguaje formation, of late Miocene age, in the Río Seco area, Falcon, Venezuela.

PLATE 9

- Figs. 1-2. *Encope secoensis* Cooke, n. sp. (p. 18).
Bottom and right-side views $\times 1$ of holotype, USNM 638634. From the San Gregorio formation, of Pliocene age, in the Río Seco area, Falcon, Venezuela.
- Figs. 3-5. *Echinolampas lycopersicus* Guppy (p. 21).
Top, left-side, and bottom views $\times 1$ of USNM 11587a. From the Anguilla limestone, of middle Miocene age, in Anguilla, B.W.I. Figured also by Jackson (1922, pl. 11, figs. 3-5).

PLATE 10

- Fig. 1. *Encope kugleri* Jeannet (p. 18).
Top view $\times 1$ of USNM 638632. From the Chiguaje formation, of late Miocene age, in the Río Seco area, Falcon, Venezuela.

- Figs. 2-5. *Eupatagus cleveï* (Cotteau) (p. 26).
Top, bottom, right-side, and posterior-end views $\times 1$ of holotype, USNM 115379. From the St. Bartholomew limestone, of late (?) Eocene age, in St. Bartholomew, B.W.I.

PLATE 11

- Figs. 1-2. *Antillaster lamberti* Jeannet (p. 24).
Posterior-end and top views $\times 1$ of USNM 638639. From the La Vela formation, of late Miocene age, at La Vigía, 10 km. southwest (southeast?) of Pueblo Nuevo, Paraguaná district, Falcon, Venezuela.

PLATE 12

- Figs. 1-4. *Brissopsis antillarum* Cotteau (p. 27).
Top, posterior-end, bottom, and right-side views $\times 1$ of USNM 638640. From the La Vela formation, of late Miocene age, on the Paraguaná Peninsula 10 km. southeast of Pueblo Nuevo, Falcon, Venezuela.
- Fig. 5. *Antillaster lamberti* Jeannet (p. 24).
Bottom view $\times 1$ of USNM 638639. From the La Vela formation, of late Miocene age, at La Vigía, 10 km. southwest (southeast?) of Pueblo Nuevo, Paraguaná district, Falcon, Venezuela.

PLATE 13

- Fig. 1. *Plagiobrissus grandis* (Gmelin)? (p. 28).
Top view $\times 1$ of fragment, USNM 638642. From beds of Miocene (?) age on the Paraguaná Peninsula 10 km. southeast of Pueblo Nuevo, Falcon, Venezuela.
- Fig. 2. *Lovenia* cf. *L. dumblei* Kew (p. 25).
Top view $\times 1$. Naturhistorisches Museum, Basel, Switzerland. From beds of Miocene age at Punta Gavilan, Falcon, Venezuela.
- Figs. 3-6. *Pericosmus stehlini* Jeannet (p. 25).
Posterior-end, right-side, top, and bottom views $\times 1$ of USNM 638638. From the La Vela formation, of late Miocene age, at La Vigía, 10 km. southwest (southeast?) of Pueblo Nuevo, Paraguaná district, Falcon, Venezuela.

PLATE 14

- Figs. 1-4. *Rhynobrissus rostratus* Cooke, n. sp. (p. 29).
Top, left-side, and bottom views $\times 1$ of holotype. Naturhistorisches Museum, Basel, Switzerland. Probably from the La Vela formation, of late Miocene age at Punta Gavilan, Falcon, Venezuela.
- Figs. 5-8. *Cassidulus falconensis* (Jeannet) (p. 21).
Top, right-side, posterior-end, and bottom views $\times 1$ of USNM 638635. From beds of middle Miocene age at Punta Gavilan, Falcon, Venezuela.

PLATES



1



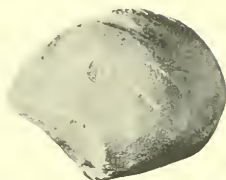
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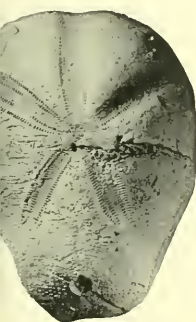
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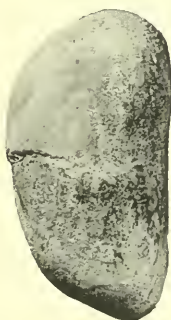
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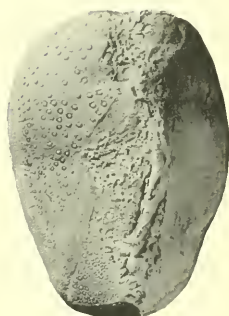
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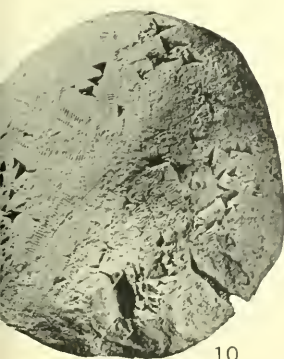
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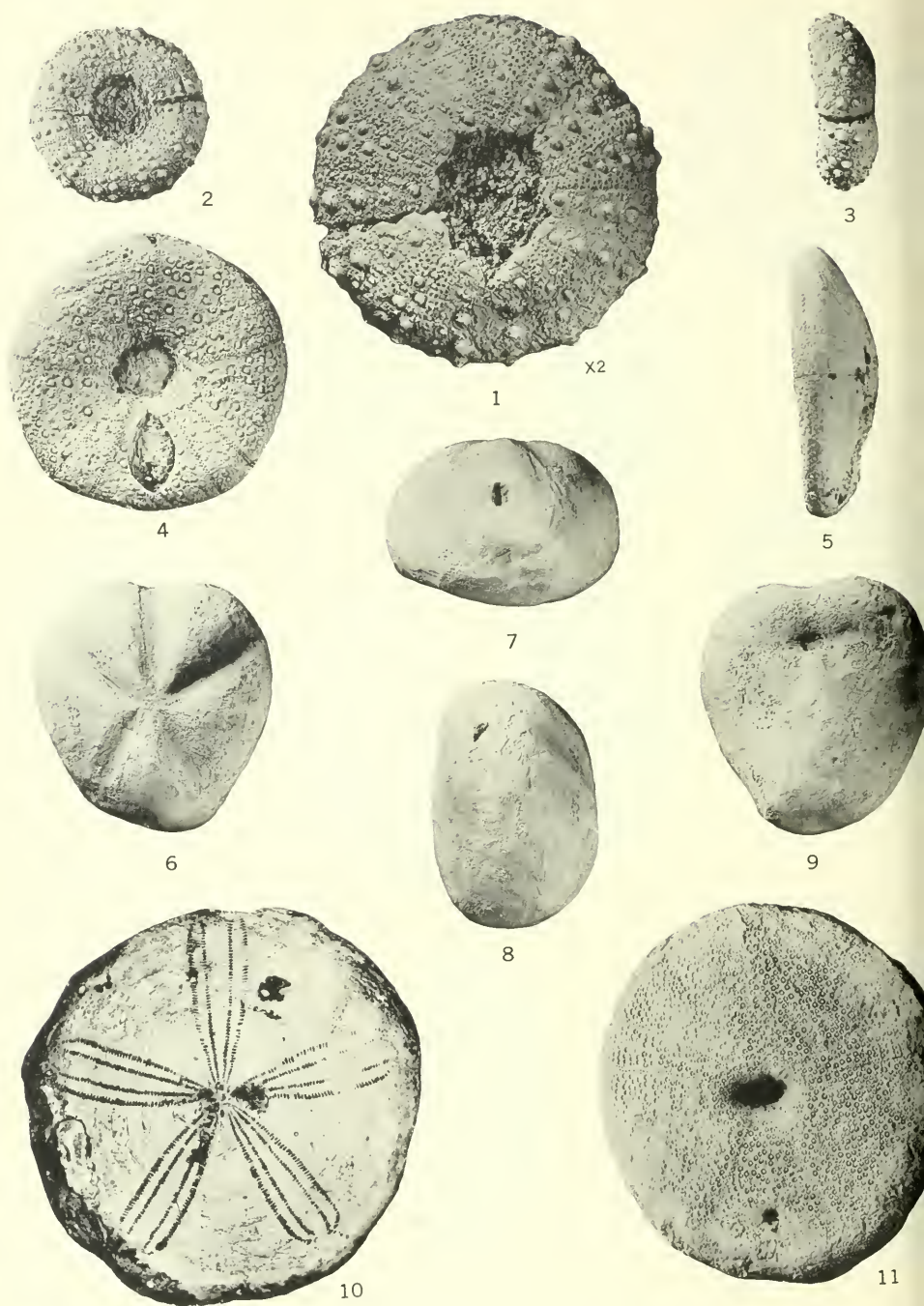


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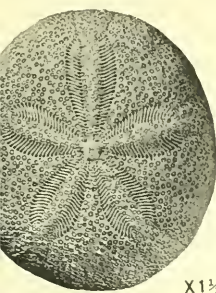


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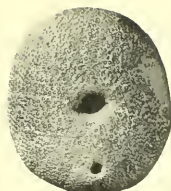
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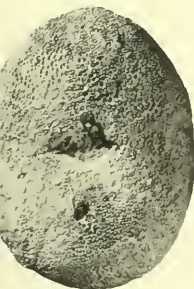
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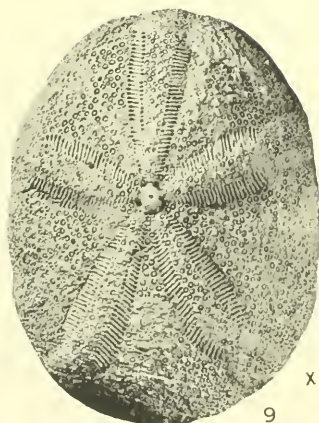
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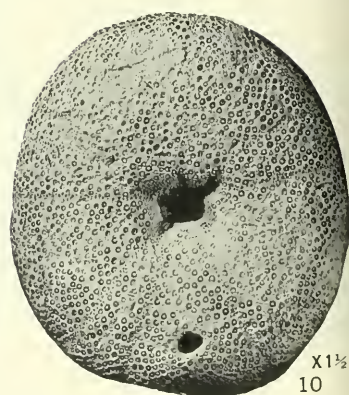
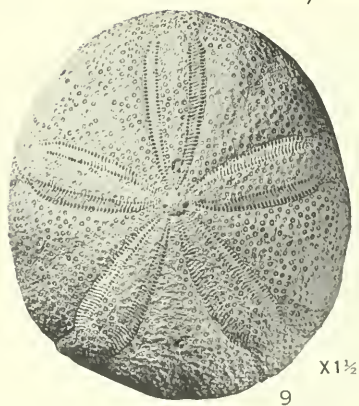
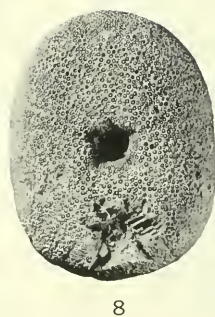
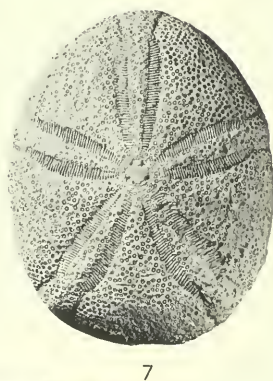
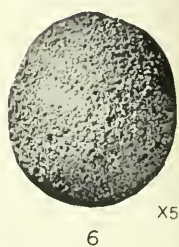
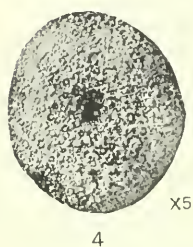
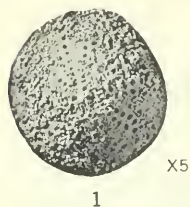


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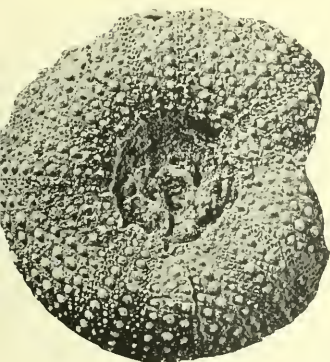


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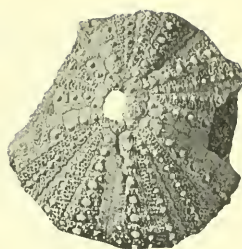
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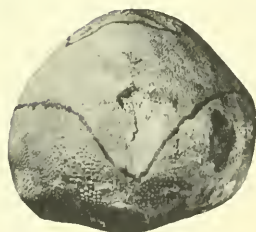
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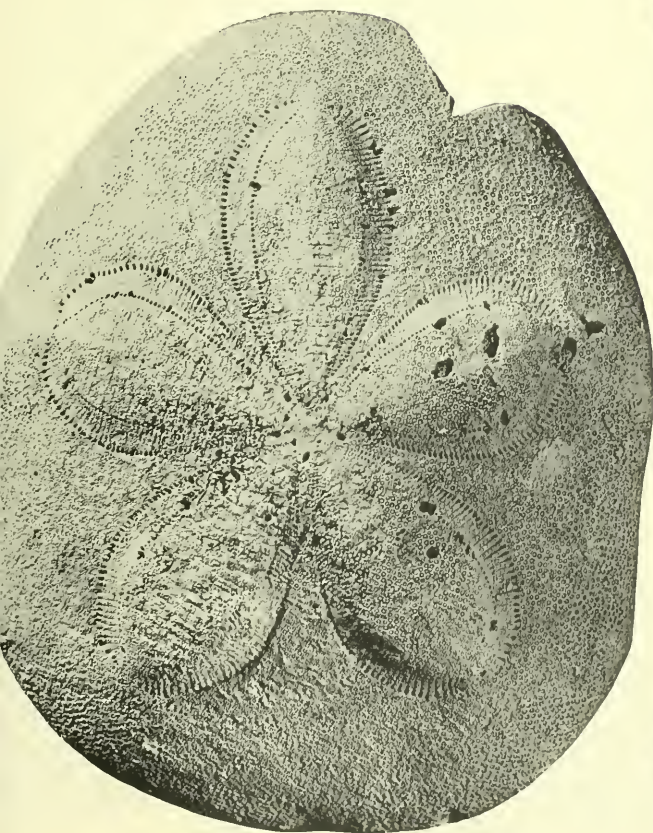
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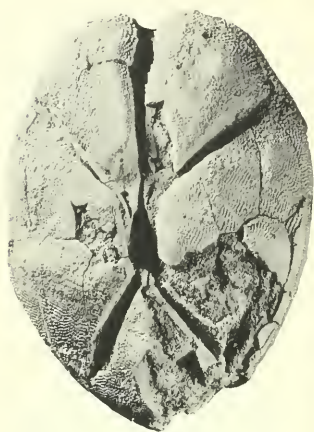


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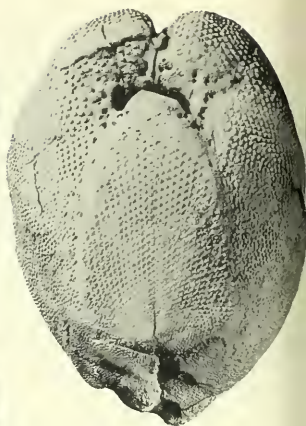
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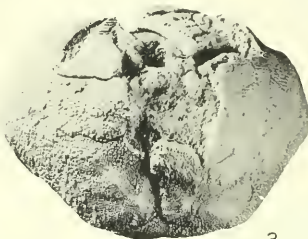
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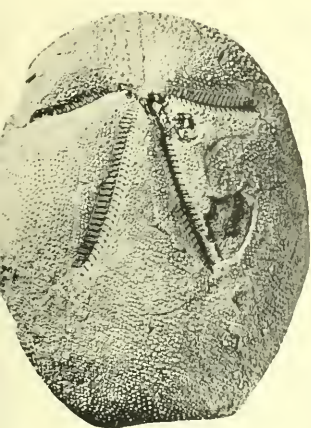


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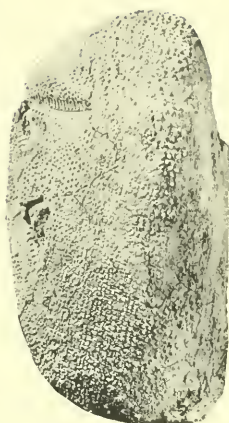


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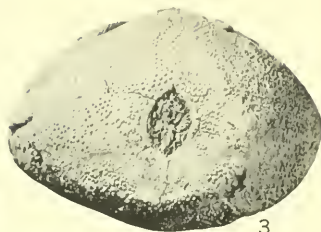
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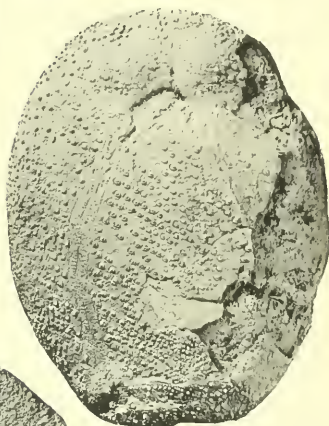
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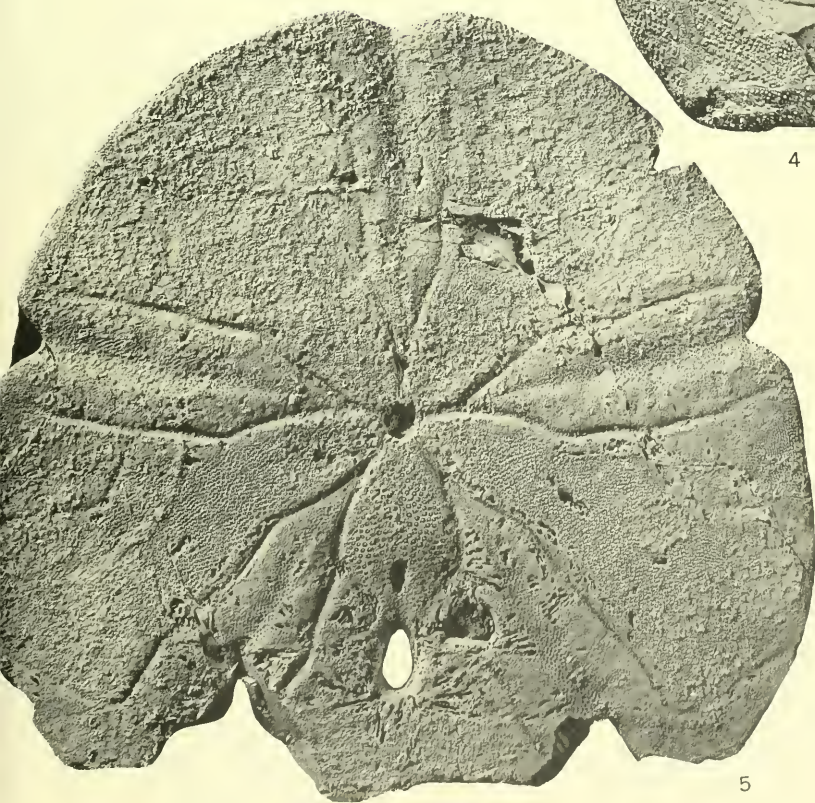
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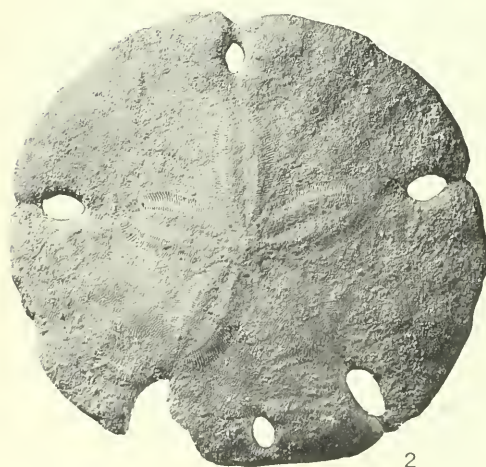
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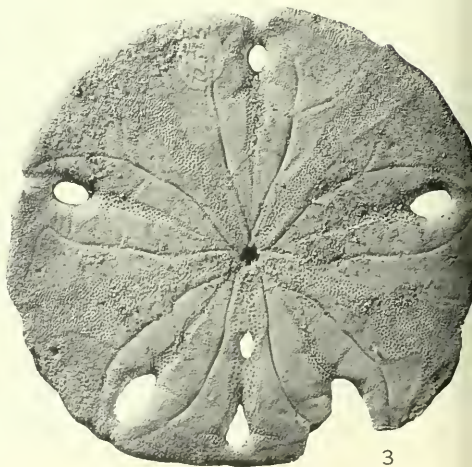
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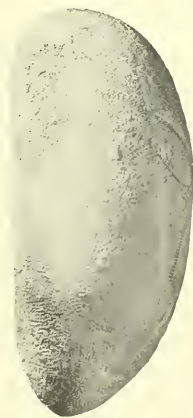
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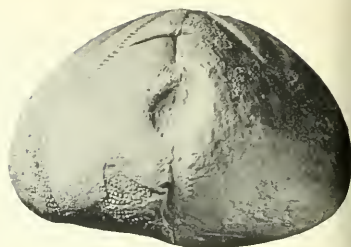


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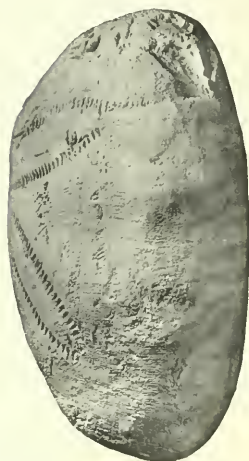
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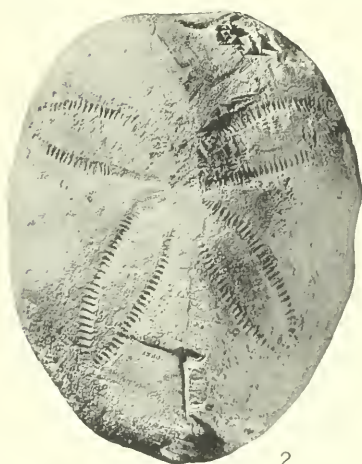
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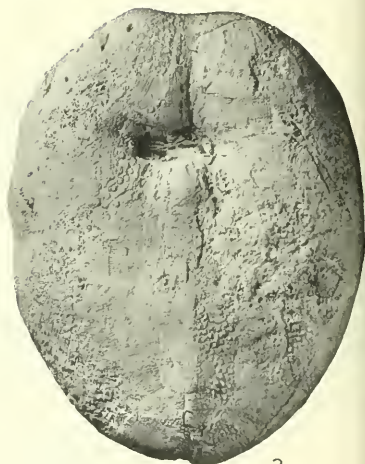
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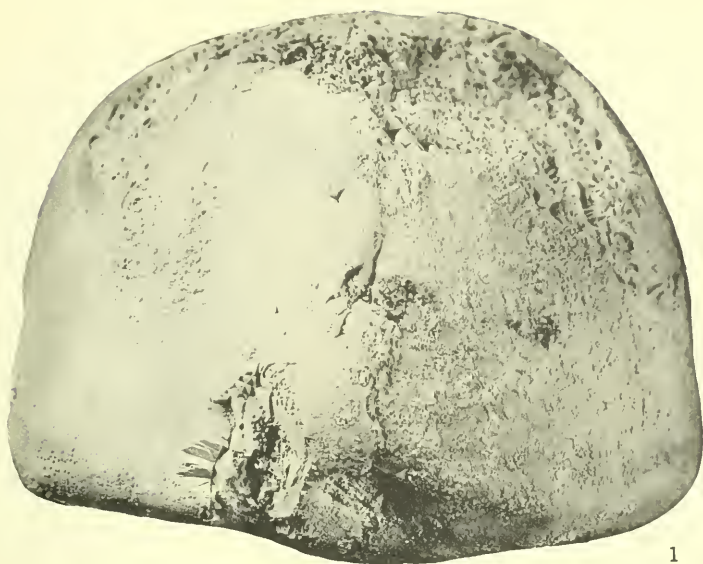


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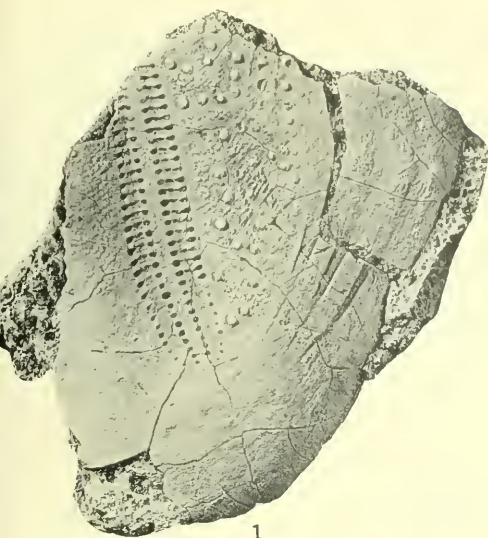
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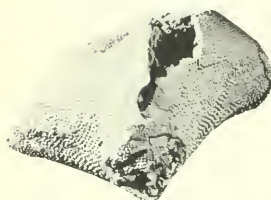
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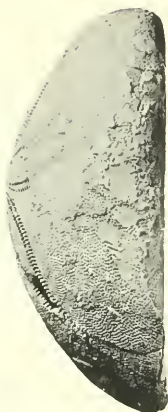
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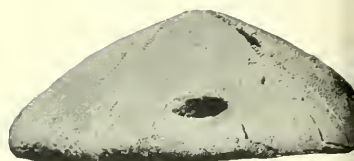
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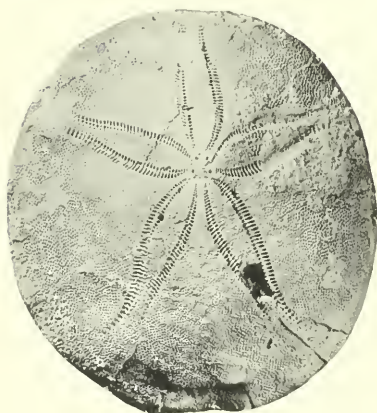
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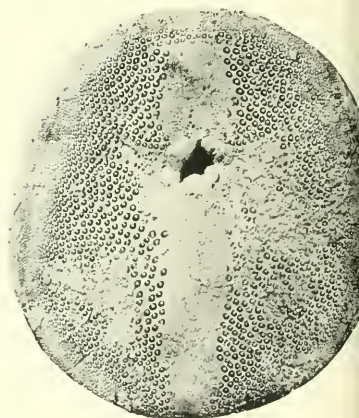
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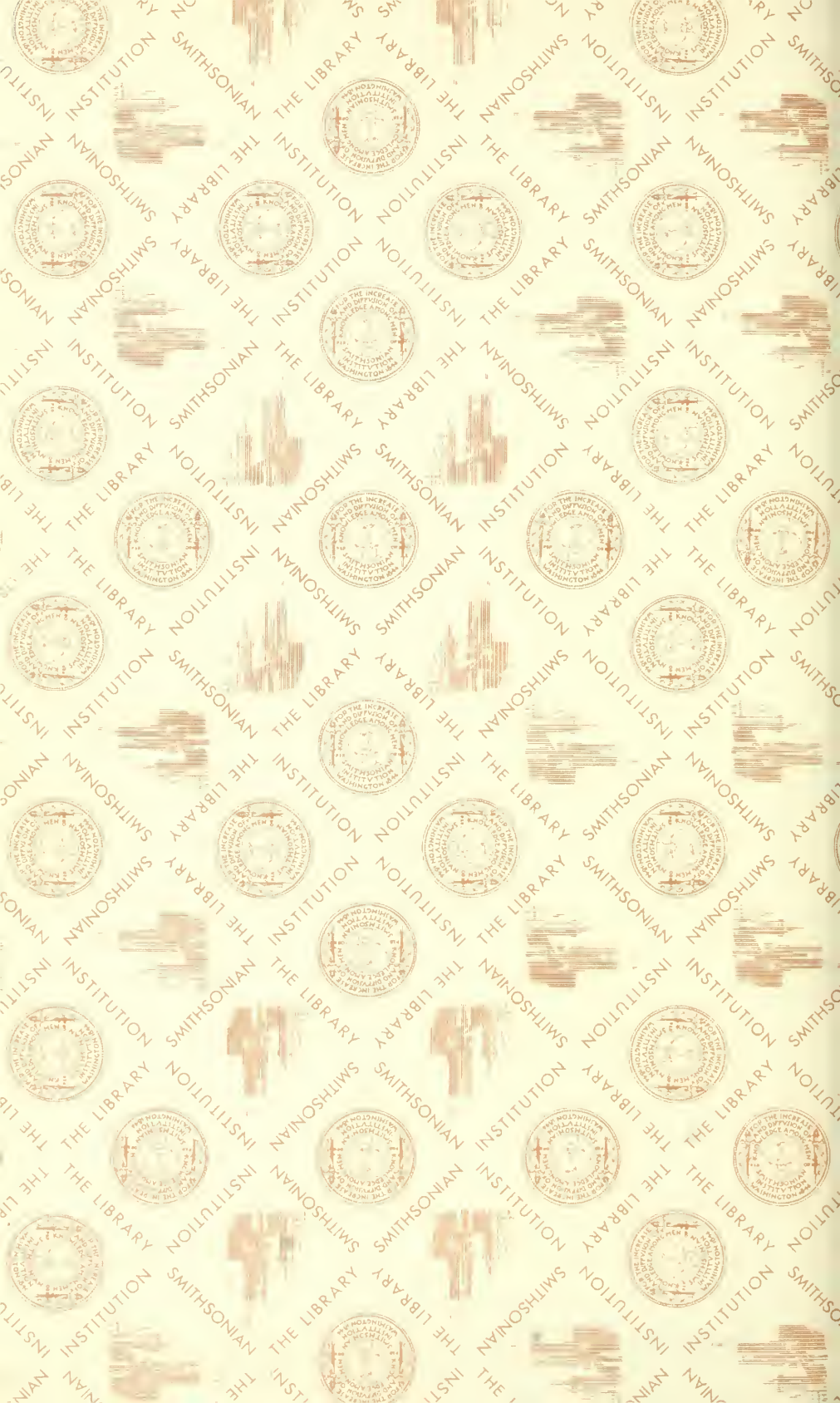
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